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FORESTLAND GRAZING

A GUIDE FOR SERVICE FORESTERS IN THE SOUTH

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INTRODUCTION

Cattle grazing has been a historic feature of Southern forest ranges since Ponce de Leon swam his herd ashore on the coast of Florida in 1521. Until recent years the value of the forage resource contained beneath the forest canopy was largely ignored and subordinated to other uses. Numerous individuals, primarily residents and small landowners within the woods, grazed some livestock on a basis of investing little in the way of livestock quality or value, or time and effort. Little return was expected - but a large part of the small return was profit.

But times are changing - development of cattle breeds able to cope with forested range conditions; knowledge of feed supplementation and plant nutrients; increased demand for beef and a recognition that there is a place for cattle in the forests along with other resources have combined to stimulate widespread interest in managed grazing in the piney woods. In the last twenty years, the Southern States have shown a steady increase in National rankings of numbers of cattle grazed - we now have about 32 percent of the total and the numbers are still climbing. By 1980 it is predicted that the population of the United States will reach 240,000,000 and the production of beef will have to be increased by about 1/3 to feed this expanded number.

The South is the only area in the Nation where large acreages of an unused, or little used, forage resource exist. There are unique opportunities for marked increases in production, and profits, to be obtained solely through improved breeds, breeding and range and livestock management. The South has the resource and the potential to continue the present upward trend in beef production until it becomes the leading area in the Nation. Much of this increase will come from forested ranges.

The increasing population and resulting increased demand for the production of goods and services will place added demands and responsibilities on the owner or manager of forested lands. Extensive management is a thing of the past - the demand for the future is intensive management and a continued high level of production of goods and services from all areas. This must be a carefully compounded mixture of simultaneous production of the many outputs the land is capable of - each resource use managed with full consideration and recognition of the needs of the others.

Within this Handbook we have attempted to point the way for the efficient use of forested lands to produce another major crop - forage and the end product of beef.

D A Craig

D. A. CRAIG
Area Director

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CHAPTER 1

RESOURCE INVENTORY

1.0 Discussion. Prior to giving any type of advice to a private landowner, or attempting to work up a forestland range management plan with him, there is the obvious necessity of measuring or estimating the resource that is available. This measure must include information on:

1. Size and shape of the range area. A picture of the land pattern - is it all one contiguous block, or long and narrow, or broken into intermingled patterns with lands of other ownerships? These considerations are all important to future livestock management.

2. Suitability for grazing. How much of the area can be used by cattle? Is part of it an unusable swamp, or with an erosion condition that precludes grazing, too steep for cattle to use? You must arrive at a net figure of what there is available to be grazed.

3. Overstory and midstory vegetation. In most of the South, the kind and quality of the understory vegetation (which we are primarily concerned with in grazing cattle) will be determined by the trees and shrubs that are growing in association with it.

4. Existing range improvements. What is there available to use in the way of fences, water developments, corrals, pastures, etc.?

5. Landowners desires. What does the landowner want to do? Frequently an area of land can support a variety of activities; some can be better for the land than others, or the financial rewards may be better with one use than another. Does the owner want to emphasize livestock use at the expense of other uses - does he want to raise a lot of game for commercial hunting - does he want to concentrate on timber production with livestock use being incidental? These are all questions that only the owner can decide and they frequently will be decided upon personal preference and desires, rather than dollars and cents, or land use capability.

Usually the forester will find it convenient to prepare a map of the range area and delineate on the map the unsuitable areas, the overstory vegetation types, and the existing range improvements. Other information pertinent to the area such as forage production, openings in the timber, fields or pastures that may be grazed in conjunction with the forested range, and points of access will be found useful if included on the map.

1.1 Range Suitability. The suitability of land for livestock grazing use is a major factor in determining grazing capacity and proper management of a unit. It is one of the most difficult items to define in the range inventory procedure, but one of the most important. It is frequently controversial and is dependent upon the knowledge and attitude of the examiner.

This is the focal point of the examiner's knowledge of cattle and their habits, range lands and their capabilities, soils and their characteristics.

Suitable range is defined as that area which is accessible to livestock, produces forage and can be grazed on a sustained yield basis under an intensive system of management without causing damage to the range or other resource values. Generally, an area that is classed as unsuitable range will exhibit a permanent or semi-permanent condition that renders it unsuitable. For example, a swampy area that is not accessible to livestock would be classed as unsuitable for grazing - similarly, a dense stand of timber that was not producing forage, or was so dense as to preclude access by livestock would also be classed as unsuitable. Some examples of items to be analyzed in determining suitability and some suggested standards are:

1. Forage Production - An area should be producing at least 100 pounds air dry weight of forage per acre to be classed as suitable range. With proper utilization, an animal would have difficulty in getting around and grazing enough to sustain itself on an area producing less than 100 pounds per acre.

2. Accessibility - An area must be accessible to livestock. Physical barriers to livestock movement such as brush, downtimber, dense timber, water or steep slopes will render an area unsuitable for grazing.

3. Slope - Any slope over 20% can be considered as having reduced value as a grazing area; a slope over 30% should be classified as suitable only if other limiting factors are absent and a slope over 40% should be considered as unsuitable for grazing. Cattle can and do derive some grazing value from slopes in the 20-40% range, but will make little use of the slopes until the flatter, more accessible country is denuded of palatable vegetation and they are forced into the steeper country. Invariably, damage to the soils will result from attempting to secure proper utilization of 20-40% slopes.

Occasionally, areas under a tree overstory will be encountered that do not meet the tests for suitability, either through lack of forage production or because of accessibility. These can be changed to favor forage production if the landowner so desires - with no loss of timber production. Any kind of timber cut that removes part of the overstory will increase the amount and nutritive value of the grasses. Prescribed burning for rough reduction, or other purposes, will immediately increase the quality and quantity of the forage. Here again, it is up to the landowner and what he wants to put into it.

1.2. Forage Production. Basic to any determination of how much grazing use can be made of an area is an estimate of the amount of forage produced. This estimated forage production is then converted into animal months of use to determine the number of cattle and the season of use that should be allowed on the area.

There are numerous methods of making forage production estimates, but for our purposes here we will be concerned with only the Ocular Weight-Estimate by Plot method. This method requires some self training on the part of the examiner, but after the training period is over, is rapid and gives consistently good results. To develop proficiency in this method, the examiner must lay out, clip, and weigh several plots along a predetermined line - the number of plots to be clipped and weighed will depend upon the individual. After the examiner has developed skill in estimating the forage weight prior to clipping, within 20% of the actual weighed figure, he then proceeds over the range area, laying down the hoop in selected areas and estimating the forage produced within the hoop area.

The green weight must be converted to air dry weight in order to arrive at a sound consistent basis for using production data in management. The moisture content of plants varies widely during the year - from 70% or more in the spring when growing and succulent, down to almost 0% during some of the winter months. Ideally, forage production estimates should be made during the late summer or fall months, when the forage has stopped growing and full production has been reached. During those months the moisture content can usually be assumed to be 40% with a fair amount of accuracy - later in the year the content will be less, earlier in the year it will be more. The total forage production, as clipped, is reduced by the percent moisture content in order to arrive at the air dry weight base for future calculations.

The actual amount of moisture content in the grasses can be accurately determined by saving the grass clippings and storing them for several days. After a period of about 10 days, weigh the clippings and continue weighing them each day until no weight change is noted and then compare this actual air dry weight with the green weight as recorded at the time of clipping. The air dry weight divided by the green weight equals the percentage moisture content when clipped.

To apply this method in the field the following materials will be needed:

1. Hoop for defining circular plots of the desired size. These are made up in such sizes that the weight of the forage contained within the hoop measured in grams will be directly convertible to pounds per acre. To accomplish this, a 9.6 square foot hoop is used -when used in transects of ten plots, the total weight in grams for the ten plots equals the pounds per acre of forage production. When used singly, the grams per plot must be multiplied by 10 to arrive at the pounds per acre forage production.

   These 9.6 square foot circular hoops are 42 inches in diameter, 131.95 inches in circumference. They may be made up of heavy wire, speedometer cable, steel rod, or a number of other heavy materials.

2. Reliable spring scales graduated in grams. A foreign made scale (Feine Federwaage (Sportwaage) scale, available from the Oxwall Tool Co., Ltd., 133-10 32nd Avenue, Flushing, New York 11354, at a price of about $7.50) is available that weighs up to 200 grams and performs very well.

3. Paper sacks for holding the grass clippings.

4. Grass clipping shears or pocket knife.

1.21 Production Transect Layout. No attempt will be made to secure a statistically sound sample of the range area - the examiner must select the sites to be sampled. He should confine each group of sample plots to a single cover type where possible and strive for mixture of sites - some of the best, some of the worst, and most in between.

The transect line should run diagonally across a slope or type to give the best sample. Where it happens to cross an area previously designated as unsuitable, it should be discontinued and then picked up again on the other side.

The plot interval to be used will depend upon the size and uniformity of the type being sampled. Decide the direction of travel and then determine the approximate distance across the type from a map or aerial photo. Select a plot interval that will space the plots evenly across the type. Twenty plots per type are usually sufficient, except for very large types, and as the examiner gains proficiency he may be able to reduce this to a smaller number.

Measure the interval between the plots by pacing. See the following page for a diagrammatic sketch of plot layout.

1.22 Collection of Plot Data. Forage production and utilization are determined in one operation.

Utilization: Estimate and record the percent of forage utilization that has taken place on the plot. This should be done as a gross for all species.

Production: During the training period, clip and weigh the forage on the plot, add to it the amount previously determined to have been utilized, and reduce this figure by the moisture content to arrive at an air dry weight. For a single plot multiply by ten to arrive at the pounds production per acre. In combining more than one plot, remember that the gram weight for each plot is equal to tenths of pounds per acre.

After a period of self training and a developed proficiency in estimating, the clipping and weighing may be discontinued and the examiner should proceed with ocular estimate alone with two daily checks by clipping to maintain his accuracy.

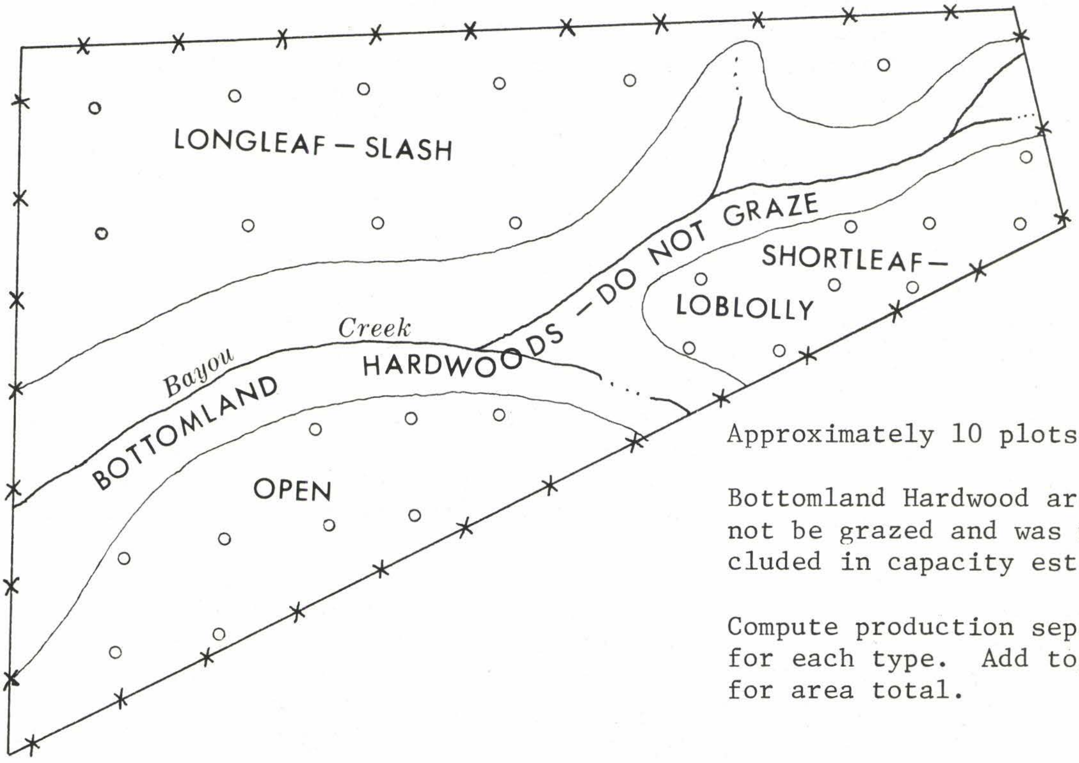
Here is an example of how the information from one vegetative type area might be recorded and the forage production for the type computed:

> R. B. Jones Ranch, Shortleaf-Loblolly area southeast of Bayou Creek, 210 acres, 10/17/66.

Plot No.	Est. Production (Green)	Est.Utilization
1	240 Gram	20%
2	160 Gram	15%
3	210 Gram	10%
4	250 Gram	10%
5	210 Gram	15%
6	170 Gram	25%
7	180 Gram	30%
8	200 Gram	45%
9	190 Gram	40%
10	150 Gram	50%
Total	1960 Gram	Average 26.0%

1960 grams x 60% (100-40% moisture content) = 1176 air dry grams for the 10 plots. 1176 ÷ 10 (number of plots) = 118 average air dry grams per plot. 118 x 10 (to convert to pounds per acre from grams per plot) = 1180 average pounds per acre forage production observed. However, it is estimated the area has been grazed an average of 26% utilization (26% used, 74% unused), then the total forage production would be $\frac{1180}{74}$ lbs. = 1595 pounds per acre, rounded to 1600 pounds per acre.
(For use of the production data in the management of the range, see Chapter 2, MANAGEMENT OF THE RANGE.)

DIAGRAMMATIC ILLUSTRATION OF
PRODUCTION-UTILIZATION PLOT LAYOUT



Approximately 10 plots per type.

Bottomland Hardwood area should not be grazed and was not included in capacity estimate.

Compute production separately for each type. Add together for area total.

1.3 Forage Species. The Southern States have a great many native grass and grasslike species (approximately 885). However, as few as twenty make up the bulk of the forage produced annually. Some grasses are grazed throughout the year, others only when young and tender; others are hardly grazed at all. Most livestock operators are familiar with the fact that cattle are more selective in their choice of forage species than are sheep, while goats will eat most any of them. This tendency of cattle to discriminate in their choice of forage species contributes to one of the major problems the livestock operator has to cope with in managing the forage resource. Cattle will seek out and use the most palatable plants first and very often overgraze them before starting to use their next choice. On a fresh burn in early spring, cattle will overgraze the lush and green first-growth, when such areas are not large enough to supply the needs of the herd.

The ability of the livestock operator to be able to identify the more important range grasses, estimate their percent of total ground cover and observe their response to grazing pressure is necessary for successful forage management.

Because grasses are the most important of the forage plants in the South and grazing management should principally be concerned with their culture and utilization, this discussion will not consider the forbs and browse plants.

1.31 Grasses. Well over 90 percent of the usable forage plants are grasses. For a grass to be recognized as a distinct species, it must have some characteristic feature or attribute which sets it apart from another species. Some grasses are so distinctly different in appearance, the livestockman will have no difficulty in recognizing them on sight. Others may be very little different from close relatives and may require a close look with a hand lens to determine small differences. To be able to distinguish the similar appearing grasses from one another, manuals or handbooks applicable to a particular area should be consulted.

One publication which will help the stockman to learn identifying characteristics of the grasses is, "Common Plants of Longleaf Pine - Bluestem Range" by Grelen and Duvall. It discusses minor variations of fifty-five of the grasses in this large area of the South and contains excellent, detailed, drawings of many of them. This is U. S. Forest Service Research Paper SO-23 and is available on request from the Director, Southern Forest Experiment Station, T-10210 Federal Bldg., 701 Loyola Avenue, New Orleans, Louisiana 70113. Similar publications which will include range grasses and forbs from the other geographic areas of the South are now being prepared for publication.

Seven genera of grasses in the South include upwards of 95 percent of the native forage species. These seven genera are the bluestems (Andropogon spp.), the panicums (Panicum spp.), paspalums (Paspalum spp.), dropseeds (Sporobolus spp.), threeawns (Aristida spp.), lovegrasses (Eragrostis spp.), and the Indiangrasses (Sorghastrum spp.). Other grasses are often locally important which are not included in the aforementioned genera.

Once the Forester is able to identify the general appearance of these seven genera when seed heads have developed, he can be fairly sure that what he sees is some kind of bluestem, panicum, threeawn, etc. Pictured on the following pages (Exhibits 1 through 7) are examples of these seven grass genera which are fairly typical of the genus. These are followed by charts showing where you may expect to find forty of the most important grasses of the South, their relative abundance, and their response to grazing and fire, when known.

1.4 Range Condition. The Service Forester must train himself to recognize certain aspects of range condition and to discuss knowledgeably the reasons why a range might be said to be in "poor" condition or "good" condition. The condition of a range is usually judged upon gross visual impressions - the factors that enter into the judgement, as will be discussed, are mentally noted and a general impression formed - it is good, or it is bad. There are methods of measuring range condition that are used by administrators, but these would have little application in advising private landowners and will not be discussed.

Range condition is the state of health of both soil and vegetation, and is based upon ecological relationships. Factors considered in the determination of range condition are the kinds and amounts of plant cover, plant vigor of desirable species and soil characteristics, particularly soil stability. Five condition classes are usually recognized in speaking of range condition - Excellent, Good, Fair, Poor, and Very Poor. An excellent condition designates little or no departure from the ecological potential and a very poor designation indicates extreme deterioration of the soil or vegetation.

1.41 Indicators of Range Condition. On a range in good condition, you would expect to see--

--A predominance of desirable forage plants. They should be healthy and vigorous with many seed stalks, approaching maximum height and bulk and of good color. Weeds and undesirable forbs will be few or absent.

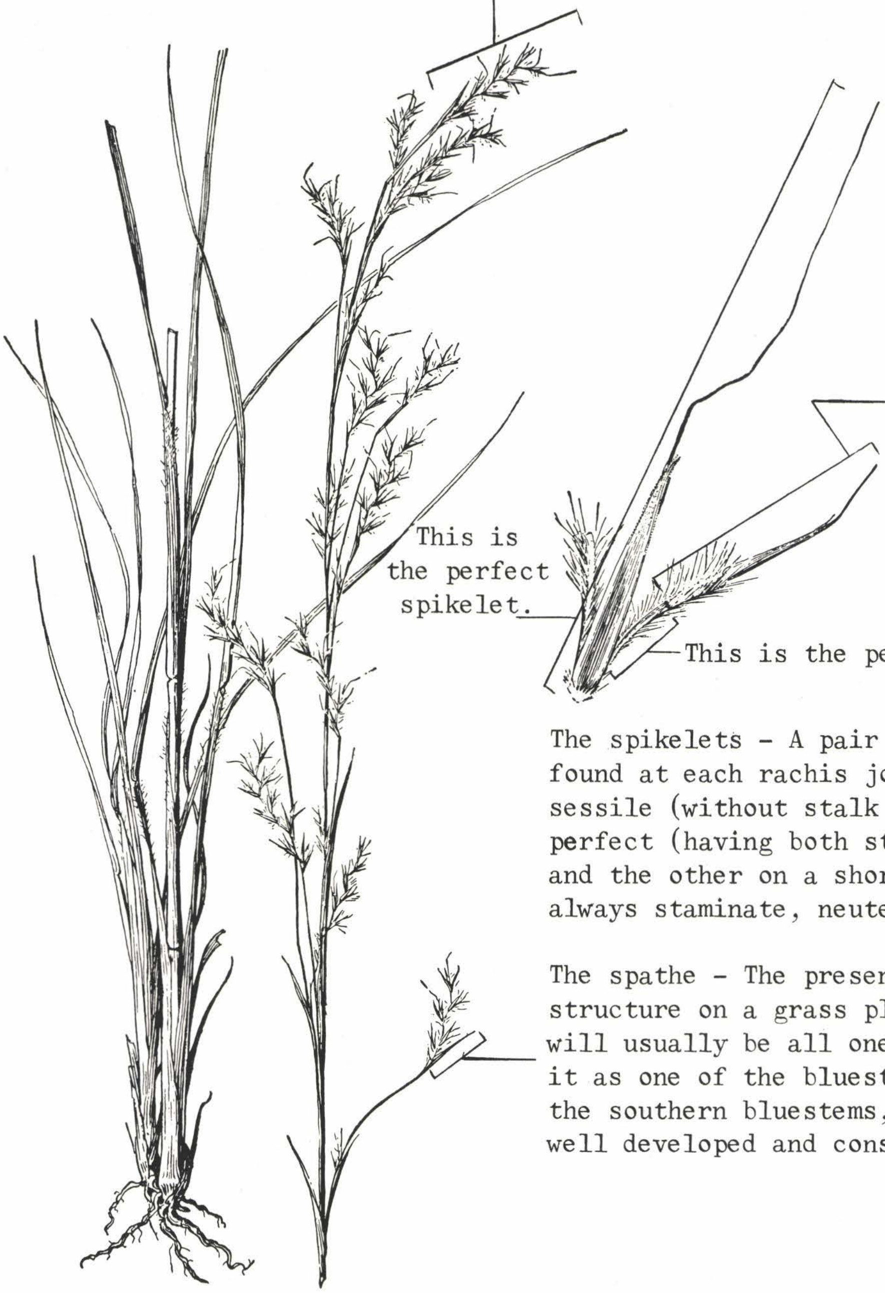
--Residue from previous years' growth should be plentiful and completely cover the soil surface that is not occupied by the live plants.

--There should be no exposed soil surface, and the soil should be easily permeable. A certain softness, from the mulch and uncompacted soil, will be felt when walking across it.

--Erosion will be generally absent, although it may be possible to have deep gullies persisting from past abuse, and still have a good forage condition on the areas between.

--Soil compaction will be absent.

Exhibit 1



The rames includes the rachis or stalk on which the several spikelets are borne in pairs.

This is the other spikelet of the pair; much reduced in size and sterile, and borne on a short pedicel or stalk.

This is the perfect spikelet.

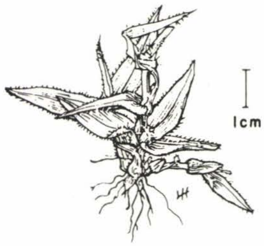
This is the pedicel.

The spikelets - A pair of spikelets are found at each rachis joint; the one is sessile (without stalk or pedicel) and perfect (having both stamens and pistils) and the other on a short pedicel, and is always staminate, neuter, or rudimentary.

The spathe - The presence of this leaflike structure on a grass plant in full seed will usually be all one needs to identify it as one of the bluestems. On several of the southern bluestems, this structure is well developed and conspicuous.

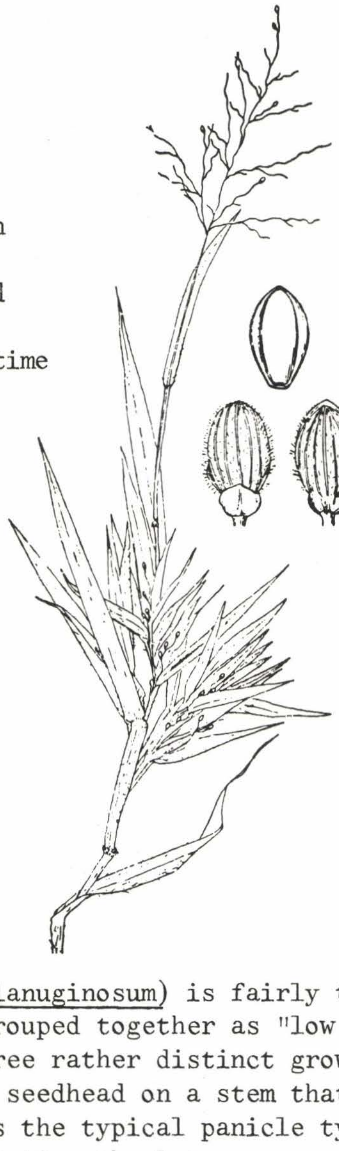
Little bluestem (Andropogon scoparius). The growth form and habit of little bluestem is typical of several of the southern members of the bluestem genus. Many of the differences of the several bluestem species are minor. All have the stalk or stem of the seedheads or rames subtended by a modified leaf or spathe. The degree of pubescence and color with most of the bluestems is extremely variable. All bluestems are perennial grasses.

Exhibit 2



Winter rosette

All of the southern low panicums have winter rosettes and are much used by livestock at this time of year.



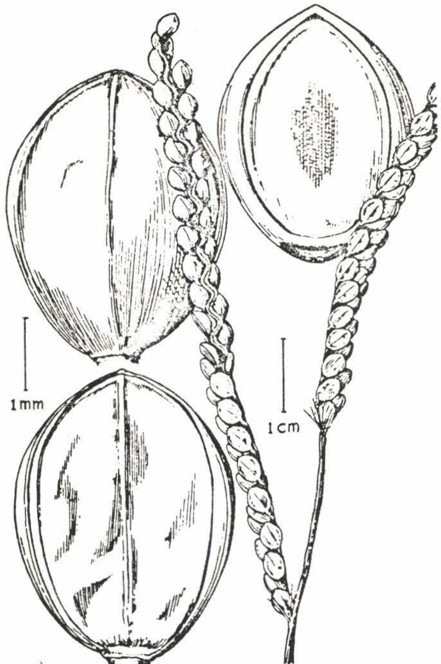
First seeds of season are borne on this early grown panicle.

The floret and two views of the spikelet of woolly panicum. There is much similarity of the spikelets among the panicums in that all glumes are nerved and rarely equal in length. The first glume is often not visible to the naked eye.

Fan-shaped branch of leafy growth harbors numerous small panicles of seeds developing in late summer, early fall and into the winter season.

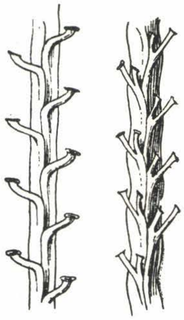
Woolly panicum (Panicum lanuginosum) is fairly typical of the several southern panic grasses commonly grouped together as "low panicums." They have in common the feature of three rather distinct growth phases. The spring and early summer growth produces a seedhead on a stem that comes well out of the leafy growth below and exhibits the typical panicle type of inflorescence shown in the illustration. By the time the late summer and early fall growth has developed from joints or nodes near the middle of the plant, most of the seeds of the early growth have matured and dropped to the ground. New seedheads are borne from the leafy fan-shaped branches but these panicles rarely exceed the length of the numerous leaves. The winter rosette of leaves at ground level or only slightly above are usually much wider and completely dissimilar from the spring and fall grown leaves, and commonly stay green throughout the winter. Panicum is an old Latin name for Millet.

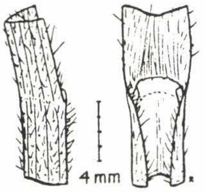
Exhibit #3



Inflorescence, two views of spikelet, and floret

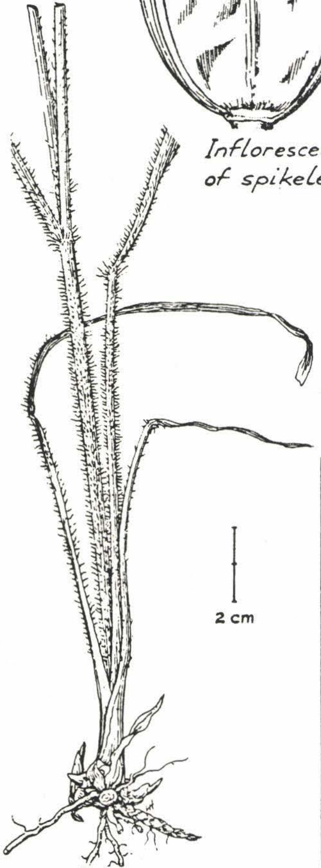
The number of racemes in paspalum vary from a single as is often found on fringeleaf paspalum to a great many as normally occur on Vasey-grass.



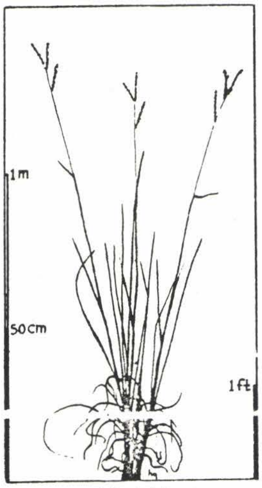


Collar and Ligule

Except for a few species, the racemes of the paspalums are outwardly remarkably similar in appearance. The rachis of many, when devoid of seeds, exhibits a zig-zag arrangement of the short stubs of stalks or pedicels which are retained on the rachis. Close examination of the naked rachis will reveal whether spikelets were arranged in two-rows or four-rows. See picture above.



Mature Plant

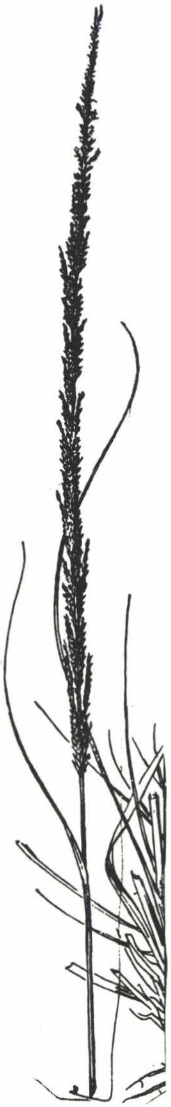


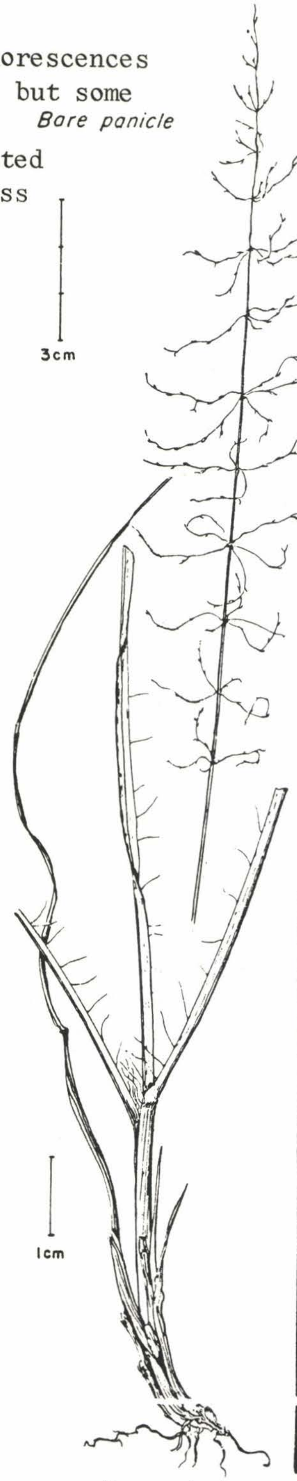
Habit

Florida paspalum (Paspalum floridanum) is found throughout the south and east and is typical of a great many of the paspalums. The South, being warm is paspalum country, with over thirty distinct species and a number of varieties found growing here. Once familiar with its distinctive type of seedhead, it is not likely to be confused with other of the grass genera. This genus includes some important introduced species, among which are Dallis-grass (paspalum dilatatum), Bahia grass (paspalum notatum) and Vasey-grass (Paspalum urvillei). All paspalums in the United States except 2 are perennials.

Exhibit #4

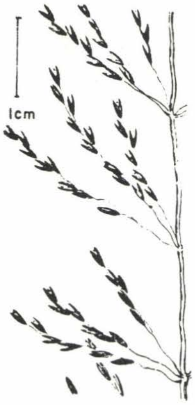
Most dropseed inflorescences are open panicles, but some appear spike-like as in this contracted panicle of smutgrass shown below.



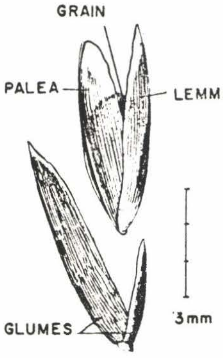


Young plant

Dropseed spikelets are always one-flowered, and usually small on an open or contracted panicle. Spikelets may show a great variation of size on the same plant.

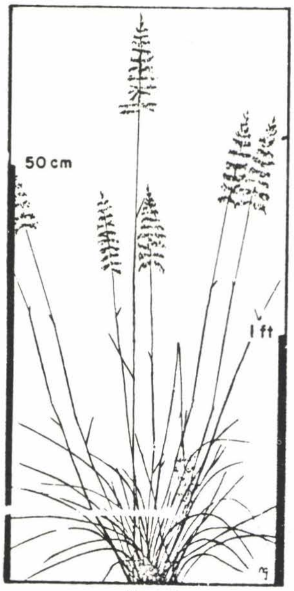


Inflorescence detail



Spikelet

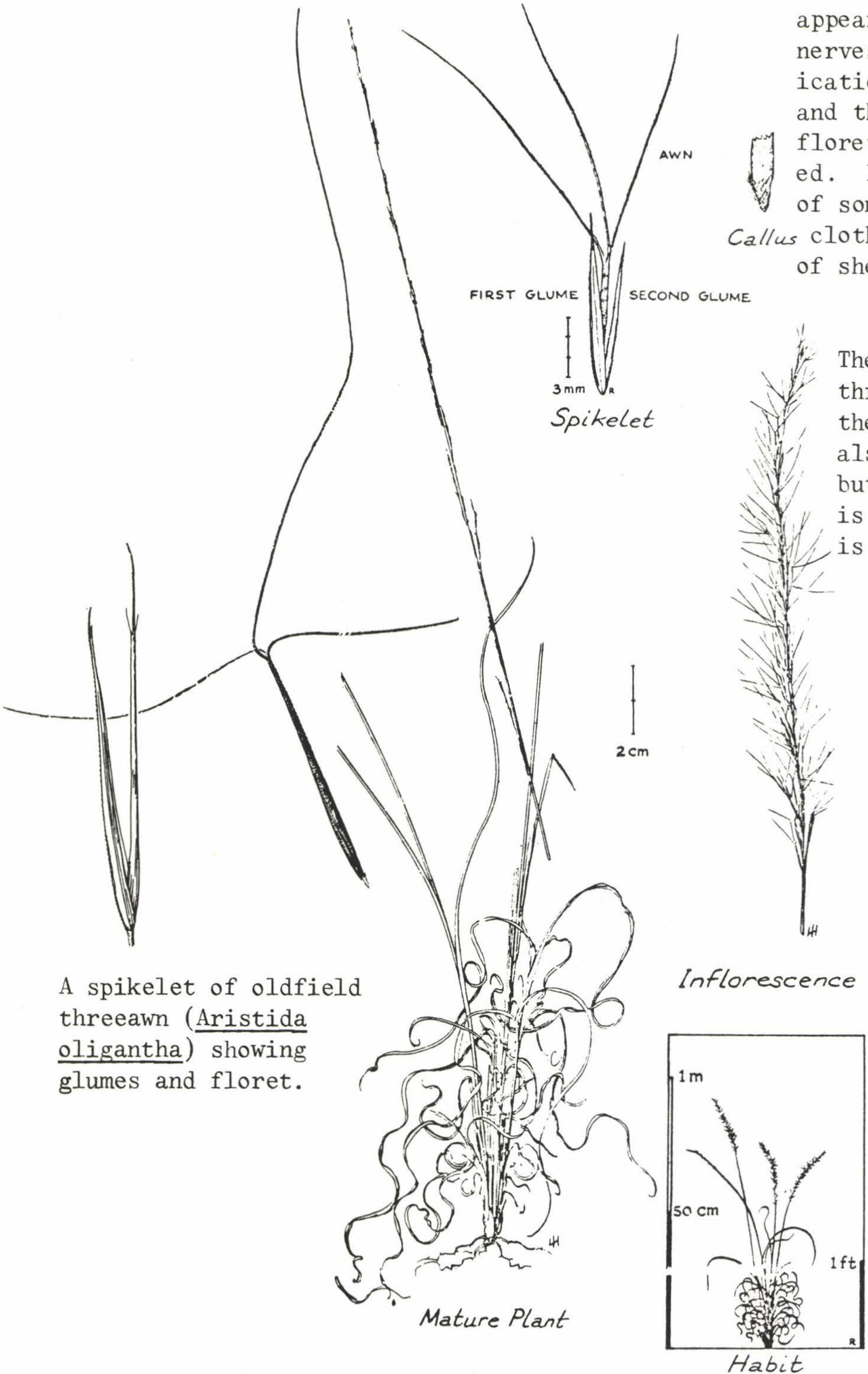
Glumes of the dropseeds are always 1-nerved and usually unequal in length with the first glume being the shorter and the second glume commonly as long as the spikelet. Lemmas are also always 1-nerved and awnless.



Habit

Pineywoods dropseed (Sporobolus junceus) is the most common of the dropseeds in the South having some forage value. When in full bloom it is a rather striking plant and easy to find among the other forage despite its usual small percentage of the total vegetation.

Exhibit #5



The floret in cross section appears round. Faint traces of nerves can be seen under magnification. Awns are usually present and the callus or lower end of floret is usually sharp and pointed. It is this part of the seed of some threeawns that penetrates clothing and oftentimes the mouths of sheep and cattle.

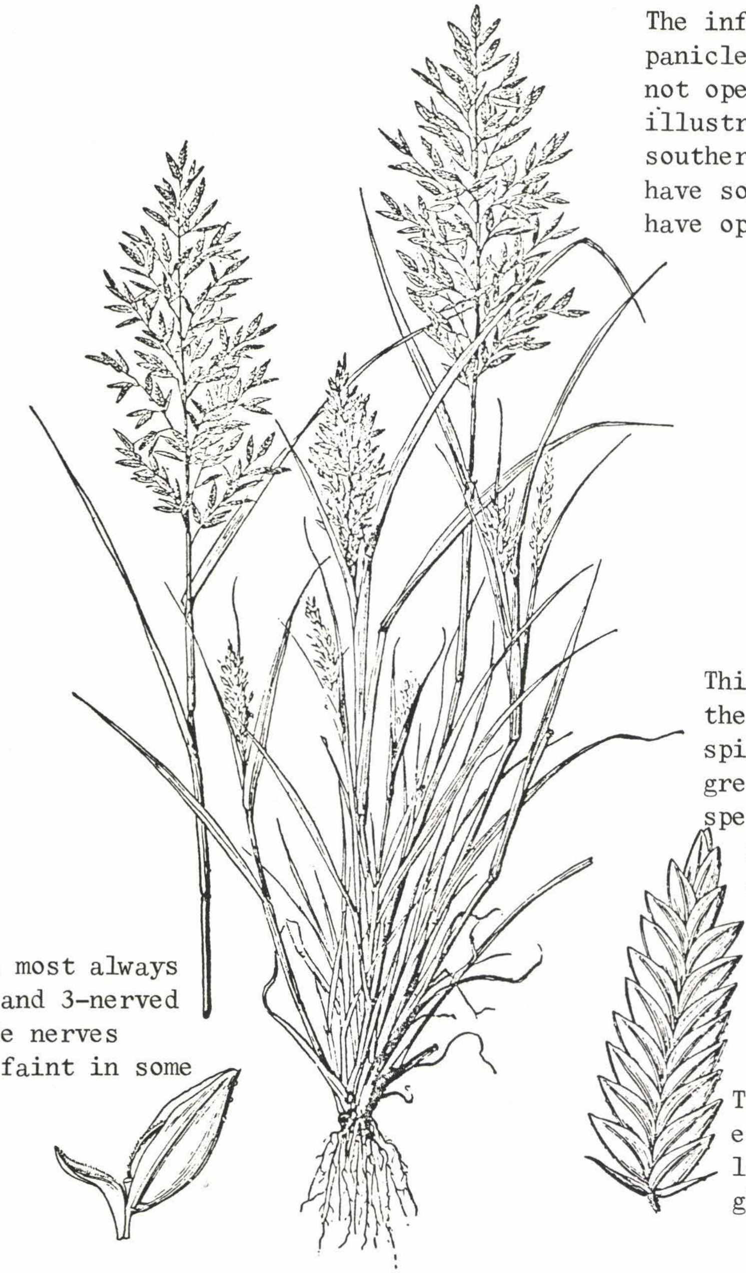
The lemma is distinctive in the threeawns, entirely enclosing the palea. This character is also true for the genus Stipa, but only one, Stipa avenacea is indigenous to the South and is rarely encountered.

Spikelets of the threeawns are always one-flowered and break off above the glumes with the floret falling free. The glumes may be either equal or unequal and are quite often persistent.

A spikelet of oldfield threeawn (Aristida oligantha) showing glumes and floret.

Arrowfeather threeawn (Aristida purpurascens) is perhaps the most common threeawn grass in the South and from the standpoint of spikelet structure can be used as a basis to describe modifications found in other southern species of Aristida. The threeawns projecting from the lemma tip is generally characteristic of the genus.

Exhibit 6



The inflorescence is always a panicle but in some species is not open as is the one in this illustration. The common southern lovegrasses, which have some grazing value, all have open panicles.

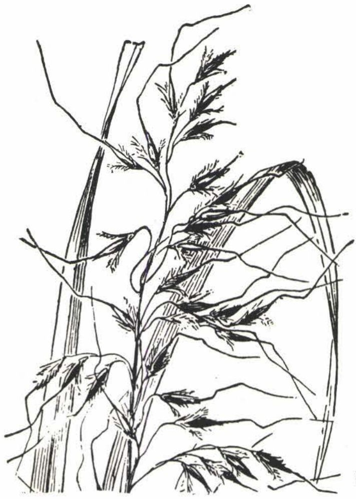
This close over-lapping of the lemmas in the lovegrass spikelet is typical for a great many of the lovegrass species. Note the large number of florets on the spikelet, which is also a common lovegrass feature.

The lemmas are most always sharp-pointed and 3-nerved with the 2-side nerves becoming very faint in some species.

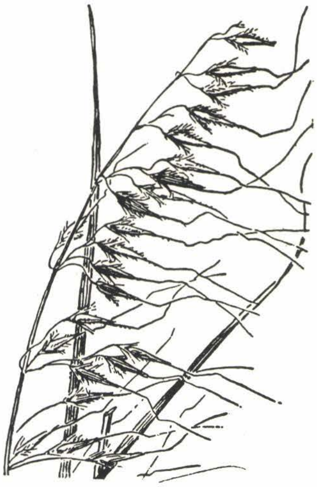
The glumes are rarely of equal length and usually 1-nerved with the second glume sometimes 3-nerved.

Stinkgrass, (Eragrostis cilianensis) is of no value as a grazing plant; it is in fact a pernicious weed occurring throughout most of the United States and was introduced here from Europe. It has been known to poison horses when eaten in large quantities. We use it here because it is so well known to livestockmen and because it shows so clearly some of the features of the lovegrasses generally. It may serve to help identify other of the lovegrasses.

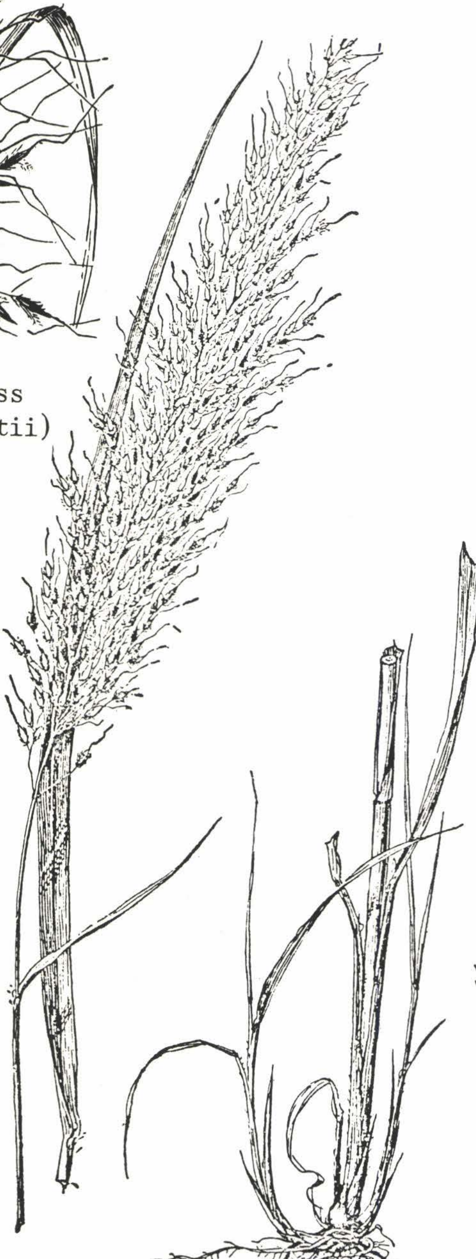
Exhibit #7

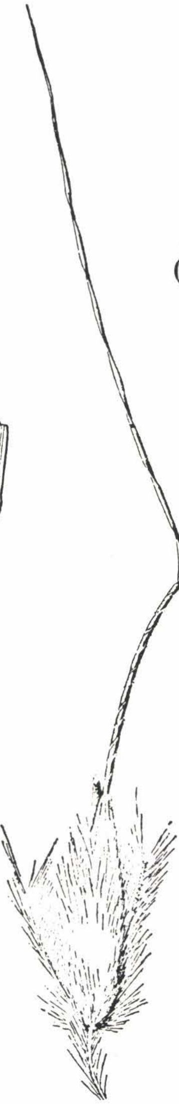


Slender indiangrass
(Sorghastrum elliottii)



Lopside indiangrass
(Sorghastrum secundum)





The awn of indiangrass is a projection of the lemma of the fertile spikelet. In mature plants, the awn is usually strongly twisted and bent.

Spikelets of indiangrass occur in pairs as do those of the bluestems but the imperfect spikelet in indiangrasses is reduced to only a hairy stalk or pedicel.

Yellow indiangrass (Sorghastrum nutans) is one of the taller of the native grasses found growing in the South. It ranks with big bluestem (Andropogon gerardii) in height and is closely related botanically to the bluestems. Three species of indiangrass find their range in the South and all generally similar. Lopside indiangrass (Sorghastrum secundum) is more common on the wiregrass ranges of Alabama, Georgia, and Florida than either of the other two species. All are excellent forage in season.

TABLE I

SOME COMMON RANGE GRASSES OF THE SOUTHEAST

Species		Range and Prevalence	Season of Most Use	Response to Heavy Grazing and Prescribed Burning	Palatability Preference during season of most use		
					High	Med.	Low
BLUESTEMS	ANDROPOGON SPP.						
Pinehill bluestem	A. divergens	Florida to E. Texas. Very common from W. Ala. to E. Texas.	Early spring, summer and fall - some all year.	Will maintain itself with burns every 3 years and 50 percent use.	X		
Elliott b.	A. elliottii	Throughout Coastal Plains. Gets up into Southern Ind., Ill., & Mo.	Grows with and used about the same as pinehill.	Will increase with burns more often than three year interval.		X	
Big b.	A. gerardii	Scattered throughout Southeast. Never very abundant.	Early spring through July - Becomes coarse in the fall.	Cannot take heavy use. Fire more frequent than once in three years will cause this grass to decrease in occurrence.	X		
Bushy b.	A. glomeratus	Common. Shows a marked preference for the sites with extra moisture.	February through May. Is only important on large marshy areas.	Rarely grazed out on site to which best adapted. Response to burning unknown.			X
Little b.	A. scoparius	Common in the west portion of the Piedmont and Okla. & Ark.	Apr. thru July. Some use made of this in winter. Cures well on the stem in Okla. & Ark.	Will thrive with use to as high as 50 percent. Yearly burns will kill it.	X		
Creeping b.	A. stolonifer	Very common from west Ala. to the east. Important in S.Ga.&Fla.	Summer and early fall.	Stands up well to heavy grazing and burning. Outcompetes other bluestems under same grazing pressure.	X		
Slender b.	A. tener	Likes drier sites. Is found throughout Coastal Plains but is abundant only where overstory is light.	The earliest of the southern bluestems to head out, spring and summer	Increases with prescribed burning. Is grazed heavily when young and tender.	X		
Paintbrush b.	A. ternarius	Scattered. Rarely found in pure stands but common throughout Southeast.	Late spring and summer into fall. Among the latest of the bluestems to flower.	Not as susceptible to smothering as other bluestems. Increases with heavy grazing.			X
Broomsedge b.	A. virginicus	Common throughout. Very conspicuous in old fields and disturbed areas.	March to June with open winters. Considerable use made of this in Dec. & Jan.	Rarely grazed closely except in mild winters on heavily stocked range. Generally under-rated as forage in the South.		X	
PANICUMS	PANICUM SPP.						
Cutthroat grass	P. abscissum	Extends from S.Car. south to the Keys. Not common in S.Car. but important south.	Spring and summer.	Rarely burned because wet site will generally not support fire. Stands up under heavy grazing well.		X	
Beaked panicum	P. anceps	Found on moist sites throughout the Southeast.	Spring and summer.	Shows quick recovery when tender, young shoots are taken in early spring.	X		
Narrowleaf p.	P. angustifolium	Throughout the Southeast. One of the more important of the low panicums.	Feb. thru May	Tends to increase under heavy use. One of the best of the low panicums.			X
Maidencane	P. hemitomon	Common on wet sites of the coastal States. Important forage in Fla.	Winter and spring. Provides a real need for livestock when most other grasses are dormant	Will decrease under continued heavy grazing and be replaced with cordgrass and carpetgrass.	X		
Woolly panicum	P. lanuginosum	Common throughout the South and Southeast. One of the better low panicums.	Early winter thru April.	Will increase under heavy grazing. Continued heavy grazing will find it replaced with annuals.		X	

Species		Range and Prevalence	Season of Most Use	Response to Heavy Grazing and Prescribed Burning	Palatability Preference during season of most use		
					High	Med.	Low
Spreading p.	P. rhizomatum	Confined generally to the coastal States. Likes extra moisture.	March through September.	Very much like beaked panicum in both sites occupied and grazing response. Heavy seeder.	X		
Roundseed p.	P. sphaerocarpon	Common in the Southeast. One of the first to head in the spring.	Used from Feb. thru May and again in the late fall.	Takes close grazing well. Used heavily on fresh burns in early spring. Tolerant of fire.		X	
Switchgrass	P. virgatum	Throughout. Sometimes locally abundant but generally least common of the important panicums.	Becomes coarse with maturity. March through July.	A decreaser under heavy grazing. Difficult to keep in stand even with moderate grazing.	X		
PASPALUMS	PASPALUM SPP.						
Fringeleaf p.	P. ciliatifolium	Throughout the South. Very common. Will withstand mod. heavy grazing.	Spring and summer.	Will increase with continued heavy grazing. Moderately tolerant of fire.	X		
Florida p.	P. floridanum	Largely confined to the Southeast. Common throughout.	Early in spring and summer.	Will decrease under heavy grazing and increase slowly with light grazing.		X	
Brownseed p.	P. plicatulum	Found in all coastal plains States. Common on more moist sites.	Late summer into winter.	Often grazed heavily in spring along road ditches and other wet sites. Bluestems easily outcompete on uplands. Increaser on moist sites.		X	
DROPSEEDS	SPOROBOLUS SPP.						
Curtiss d.	S. curtissii	Largely confined to the wiregrass ranges of S.Ga., Ala. and Fla.	Late fall and winter.	Burning will decrease the amount of Curtis dropseed in the total cover. Tolerant of heavy grazing and shade. Increases on unburned sites.		X	
Pineywoods d.	S. junceus	Extends all along the coastal plain from Tex. to Fla. and up into Virginia. common.	Spring and early summer and during the winter.	Tolerant of fire and grazing. Frequent fire will decrease amount of this in the stand.			X
THREEAWNS	ARISTIDA SPP.						
Arrowfeather t.	A. purpurascens	Throughout the Southeast. Range extends into the Midwest and New England.	Fresh burned range in spring.	Increaser. Comes close to being an invader. Very tolerant of fire.			X
Pineland t.	A. stricta	Coastal Plains from Miss. east to N.Car. Common in S.Ga., Ala. and Fla.	Fresh burned range in spring. Some use during winter.	Can be maintained in stand if moderately grazed. Increases with fire.		X	
Trinius t.	A. virgata	Has about the same range as pineland threeawn. Not as common however.	Fresh burned range in spring and winter.	Heavy grazing will cause it to decrease. Tolerant of fire.			X
LOVEGRASSES	ERAGROSTIS SPP.						
Elliott l.	E. elliottii	N.C. to east Texas. Shows preference for wetter sites.	Early spring. Most abundant in Fla.	Increaser. Shows a good tolerance of fire.			X
Coastal l.	E. refracta	Limited to the Coastal Plains States. More common in Fla. and Ga.	Early spring.	Increaser. The most palatable of the perennial lovegrasses.		X	
Purple l.	E. spectabilis	Common everywhere east of the 100th meridian. Very showy in fall.	Early spring.	Increases with heavy grazing and frequent burns. A sand lover.			X

Species		Range and Prevalence	Season of Most Use	Response to Heavy Grazing and Prescribed Burning	Palatability Preference during season of most use		
					High	Med.	Low
INDIAN GRASSES	SORGHASTRUM SPP.						
Slender i.	S. elliottii	Throughout the South on sandy soil. More common in the east.	Late spring and summer.	Decreaser. Does not have rhizomes but is deep rooted.	X		
Yellow i.	S. nutans	Eastern U.S. west to the Rocky Mtn. Range.	Late spring and summer.	Can't take heavy grazing. Hot burns damage rhizomes.	X		
Lopside i.	S.secundum	Largely confined to wiregrass types in Fla.,S.Ga., Ala., and coastal S.Car.	April, May and June. Seed-stalks readily eaten in late summer and fall.	Decreaser.	X		
OTHER IMPORTANT AND COMMON GRASSES OF THE SOUTH AND SOUTHEAST							
Goobergrass	Amphicarpum muhlenbergianum	Fla., Ga., and S.C., very common in S.Florida.	Summer and fall. Some used yearlong	Increaser. Shows good response to discing or roller cutter.		X	
Green silkyscale	Anthaenantia villosa	Throughout the South.	Summer.	Increaser. Moderately tolerant to fire.		X	
Giant cane	Arundinaria gigantea	Throughout the South.	May to Jan.	Decreaser. Burning followed by heavy grazing will kill it.	X		
Switchcane	A.tecta	Mainly east of Mississippi River.	May to Jan.	Decreaser. Shows same response to grazing and fire as above.	X		
Common carpetgrass	Axonopus affinis	Coastal Plains.	Spring and summer.	Must be grazed to stay in stand. Will tolerate heavy grazing. An invader species.	X		
Toothachegrass	Ctenium aromaticum	Coastal Plains - Mainly wetter sandy sites.	Early spring after fresh burn.	Because of site, rarely killed by fire. Tolerates moderate shade and litter. Will increase on unburned sites.		X	
Skeleton grass	Gymnopogon ambiguus	Coastal Plains north to Ohio River.	Fresh growth after a burn. Becomes very coarse.	Fire tolerant - will increase with heavy use following disturbance.			X
Cutover muhly	Muhlenbergia expansa	Coastal Plains, east Texas to Fla. and Va. Common on infrequently burned sites.	Late fall and winter. Is closely cropped in spring on fresh burns.	Decreases under heavy use and frequent burns		X	
Pine barrens tridens	Tridens ambiguus	Coastal Plains, Texas to Fla, and S.C. mainly on poorly drained soils	Spring and early summer.	Increase with burning. Can't tolerate heavy rough or dense shade.			X
Purpletop	Tridens flavus	Eastern U.S. Most prevalent on moderately to heavily wooded sites.	Summer and early fall.	Decreaser under heavy grazing. Tolerant of fire.		X	
Longleaf uniola	Uniola sessiliflora	Coastal Plains Piedmont and into East Texas and Okla.	Spring and early summer.	Decreaser. One of the most shade tolerant grasses in the South and somewhat tolerant to litter buildup.			X

--Evidence of cattle grazing will be noted only by observing utilization on the grasses and forbs and occasional tracks and droppings. There should be little or no evidence of trailing or trampling.

On a range in poor condition you would observe--

--A predominance of weeds and undesirable forbs and annual grasses. There may be perennial grasses of low palatability. Any good forage plants that may exist would form but a small part of the vegetation; and those plants would be stunted and of low vigor, have few or no seed stalks, and probably be heavily grazed. In some areas, an invasion of low value or worthless shrubby plants or trees will be occurring or have already occurred.

--There will be little or no residue from previous years' growth of plants.

--There will probably be bare soil areas interspersed between the plants. The soil will be compacted and slowly permeable. Runoff will be rapid. Walking across the area, it will feel hard and unyielding.

--Erosion and soil movement will probably be evident, depending upon several factors such as duration of the poor condition, rainfall, soil type, etc. Gullies may be present, and a deposition of eroded soil will be observed at sticks, stones, or plants. Plants may be stooling--growing on a hummock caused by erosion of the surrounding soil. Rocks and sticks may be found on pedestals.

--There will be ample evidence of cattle grazing - a multitude of tracks and heavy use of the current growth of palatable plants (if grazing has occurred during the year).

1.5 Range Improvements. An inventory of the range resource on an area must include a determination of the range improvements present and their condition. Inspect the improvements with sufficient thoroughness to answer the following questions:

1. Fences. Are the exterior boundaries of the tract fenced - any interior fencing? What kind of condition are they in - good enough to contain livestock? Are gates in the right places and adequate? Are cattleguards needed on some well traveled roads? Watergaps in place and effective? What additional fencing or improvement of existing fence may be needed to adequately control the livestock and achieve management objectives?

2. Waters. What kind of waters are present on the area - springs, wells, stock ponds, live streams? Are they permanent or temporary? Are they effective in providing water for livestock? Are they well distributed over the allotment? Fenced or equipped with other control so that they can be made unavailable to livestock, if needed? What additional water development or improvement is needed? Should more waters be built to achieve better distribution or provide sufficient water? Should improvement work such as bentoniting ponds or providing additional troughs at wells be done?

3. Livestock Handling Facilities. What is available in the way of corrals, squeeze chutes, holding pens, traps, etc.? What is their locations? Are they adequate and properly located to take care of the animals?

4. Revegetation Areas. Are there any improved pastures or range revegetation areas to be considered in the management of the cattle on the range? If so, are they fenced? What areas are there that could be made into improved pastures for use in conjunction with the woodland grazing?

All of this information, and more that will probably occur to the examiner, will be needed to give the proper advice to the landowner and to work into the management planning program.

CHAPTER 2

MANAGEMENT OF THE RANGE

2.0 Discussion. Here is the objective of the entire range management profession - the grazing of livestock on a range area in such a manner as to provide a high level of continuous production without damage to the range or other associated resources. It requires the careful blending of many factors - proper numbers of animals, proper seasons of use of the forage plants, proper distribution of the animals over the range, coordination with other resource uses and proper supplementation of the animals' diet with salt, minerals, concentrates, or hay.

Historically, Southern forestlands have been grazed with uncontrolled numbers and essentially no management. The livestock were turned loose in the woods and shifted for themselves, with the owner making an occasional roundup whenever he needed some stock to sell. Under this system, calf crops were low, in the 30 to 50 percent category, with sale weights of 250 to 300 pounds. Mortality was high. Forest Service research scientists have consistently produced 80 percent calf crops and marketing weights of 450 to 500 pounds through management of the cattle and the resource.

In this Chapter, the forester will find some basic information to guide him in preparing a multiple use management plan and giving advice to the private landowner. Much of the success of the plan will depend upon the skill of the forester in recognizing conditions and devising management solutions to meet the need of the individual area. The plans cannot be stereotyped - each must be tailored to meet the needs of the individual area, and each area, as well as each landowner, is different.

2.1 Stocking Rates. One of the first questions the landowner will ask, and often the question uppermost in his mind, is "how many cows can I graze?". Unfortunately there is no hard and fast answer to this. He can be given an ultra conservative answer which will limit the numbers and provide for most eventualities, but this probably would not be the most economical use that could be made. On the other hand, an answer that might provide for heavier stocking with the assumption of good landowner management of the range and cattle could then result in damage to the range through failure to get proper distribution, or make prescribed burns, or numerous other variances that affect actual safe grazing capacity.

Grazing capacity is dependent upon many variables. The forage production that is measured represents what is available for livestock consumption at that particular time, and as a result of the specific weather and overstory conditions that existed during the year of measurement. Production could change drastically by the next year due to changes in weather or overstory or the use that has been made of the range. Regardless of the forage that is present, the manner in which it is used has more effect on the numbers that can be run than almost any other factor. Poor distribution of the animals, grazing at the wrong season, failure to feed supplements or hay can and will have a direct and profound effect on the ability of an area to support sustained livestock use.

In determining stocking rates, it should be remembered that light use will usually give the greatest weight gains per animal, and will preserve good range condition, but will probably not produce the optimum beef production per acre of range; heavy use may temporarily produce the most beef per acre, but at the expense of range condition and future production. The optimum combination of weight gains per acre and preservation of good range condition is to be found with moderate use.

2.11 Use of Forage Production Data. The principal purpose of establishing the forage production plots described in the preceding Chapter was to secure an estimate of the production of the range area for conversion into an estimated grazing capacity. To do this, for each type:

1. The green weight production figures from all of the plots in the type are added together.

2. Reduced by an appropriate percentage to arrive at an air dry weight (40% recommended for late summer and fall use).

3. Divided by the number of plots to arrive at a plot average.

4. Multiplied by 10 to give the average pounds of production per acre.

5. Reduced to 40% (assumed proper use) of the average to arrive at what is available under proper utilization.

6. Divided by 40 (pounds per acre forage disappearance per day with a cow-calf operation) to give the number of cow-calf days available.

7. Multiplied by the acres of suitable range in the type.

8. Divided by 30 (days per month) to give the number of animal months forage that is available.

For example, using the information from page 5, Chapter I:

1600 pounds air dry forage production
1600 x 40% (proper utilization) = 640 pounds of forage per acre available
$\frac{640}{40}$ (pounds per cow-calf day) = 16 cow-calf days per acre
16 x 210 (acres in the shortleaf - loblolly type) = 3360 cow-calf days for the type
$\frac{3360}{30}$ (days per month) = 112 cow-calf months available
or 112 cows with calves for one month
or 56 cows with calves for two months
or 37 cows with calves for three months, etc.

The final figure may, as indicated, be manipulated for the desired season by dividing the animal months by the number of months in the season to arrive at the stocking rate for that period. Conversely, divide the calculated animal months by the number of animals to be grazed to arrive at a length of season.

Do this for each type in the area; add all types together for an area total.

See Table II for a pre-calculated acres per cow month for certain production levels:

TABLE II

Approximate grazing capacity for a cow-calf operation in relation to amount of forage per acre, at 40% utilization and 40 pounds per day forage disappearance.*

Forage per Acre	Acres per cow month
100	30.0
150	20.0
200	14.9
300	10.0
400	7.6
500	6.0
600	4.9
700	4.3
800	3.7
900	3.3
1000	3.1
1200	2.5
1400	2.1
1600	1.9
1800	1.6
2000	1.4

Stocking rates calculated on the basis of forage production are the best means available to tell a landowner the number of cattle that should be permitted to graze on a given area. However, any initial stocking rate that is used must be refined over a period of years by close observation of the effects of the use on the ground.

2.12 Forage Utilization. Forage utilization is expressed in terms of a percentage of the plant used, of that which was available for use. In the case of grasses and forbs, the entire volume above ground is considered available for use; in the case of shrubs and trees, only that within reach of the animals is available. Since cattle cannot graze beyond about a 3/4" stubble, 100% utilization of grasses with cattle cannot be achieved.

*For 50% utilization, multiply acres/cm by .83
*For 60% utilization, multiply acres/cm by .66

Forage utilization is estimated using the procedures described in Chapter I for estimating forage production. On grazed ranges, the examiner will find it useful to train himself in estimating by clipping and weighing some previously established protected plots, or by finding ungrazed areas to clip and weigh and compare with the grazed areas.

Forage utilization estimations may be used to arrive at a rough calculation of grazing capacity on a grazed range by:

1. Estimating the percent of forage utilization.
2. Dividing this by the number of months of grazing that has transpired to arrive at the percent per month that is being utilized.
3. At the utilization rate per month, calculate the number of months remaining before proper utilization is reached.

For example:

An area has been grazed for 3 months and is 26% utilized. Desired utilization is 40% (14% short of goal).--

--3 months = 26% or approximately 8% per month use
--14% remains to reach the desired utilization or 2 more months @ 8% utilization per month.

About 2 months grazing left at the present rate of stocking. Numbers and time may be juggled to meet the landowner's objectives. For example, twice as many cattle grazed for half the time or half the cattle for twice the time.

This method has its greatest application on seasonal ranges where growth of the plants is well along or complete prior to the grazing season. The greatest application of forage utilization information is in:

1. Calculating when proper use has been made of the range and it is time to move livestock to other range.
2. Seeking out areas of over utilization and areas of under utilization that indicate improper distribution and point towards refinements or changes that may be needed in the management plan.
3. Refining the initial grazing capacity estimates. If over utilization has occurred before the end of the grazing season, then the stocking is too heavy.

Practically every plant species has its own tolerable limits of utilization beyond which it cannot sustain itself and reproduce. Continued grazing beyond this limit will result in a weakened plant, a reduced root system; making it susceptible to drought, decreased forage production, and eventual death. 40% is considered the average conservative utilization for most species found on Southern ranges. Some plants such as carpetgrass can withstand much heavier use, and must have it in order to stay in place against competition from other plants which cannot tolerate the same degree of use.

Here are some plant appearance guides for estimating forage utilization:

Light Use (25 - 30 percent forage removal): Grazing patchy and leaf tips bitten off less than three-fourths of the grass tufts. No obvious removal of leaves from pineland threeawn.

Moderate Use (40 - 45 percent forage removal): Leaf tips bitten off more than three-fourths of the grass tufts, but occasional patches ungrazed. Obvious pulling of center leaves from pineland threeawn.

Heavy Use (60 - 70 percent forage removal): Leaf tips bitten off all grass tufts and average stubble height 4 inches or less. Most center leaves pulled from pineland threeawn.

2.13 Animal Unit Equivalents. For the purpose of planning the use of grazing lands and estimating degree of use, the standard livestock unit will be the "animal unit" defined as one mature cow, with or without unweaned calf at side, or equivalent.

The following equivalent values are considered as standard to be used for converting animal units to other classes of stock:

Cattle:

Weaned calves and yearlings	.6 Animal Unit
Mature cows and steers (cow with or without unweaned calf at side)	1.0 Animal Unit
Bulls, 2 years and over	1.3 Animal Unit

Horses:

Yearlings	.75 Animal Unit
Two-year-olds	1.00 Animal Unit
Three-year-olds and over	1.25 Animal Unit

Sheep, Goats, and Deer:

5 weaned lambs, kids, and yearlings	.6 Animal Unit
5 ewes or does, with or without unweaned lambs or kids	1.0 Animal Unit
5 rams or bucks	1.3 Animal Unit
5 deer	1.00 Animal Unit

Converting equivalents should not be used to convert grazing capacity estimates from sheep and goats to cattle and horses, where it is possible to determine the grazing capacity on the basis of the values of forage plants for each kind of livestock.

2.2 Range Readiness. Range readiness is a term used to describe that period of time when livestock may safely begin grazing fresh, spring forage growth without inflicting intolerable damage to the key grazing species. It is, of course, an important economic consideration to the rancher to "turn on" fresh grass as soon as he can safely do so, to avoid prolonging the costly winter season feeding of grain and hay. Turning cattle on to spring range too soon is a common practice in the South. This is especially damaging to fresh burned range. Grasses and forbs just beginning new growth in early spring need sufficient time to develop new root growth and a healthy crown. This is also a critical time for seedlings. Because of the usual soft soil conditions at this time of year, new seedlings are easily pulled from the soil by grazing livestock.

Range readiness will differ with grass species, kind of season, (early, late, wet, or dry), latitude, elevation and condition of ground and ground cover resulting from management and climate the previous season or seasons. It disturbs many ranchers to see the fresh, green growth in the spring produce much more forage than their livestock can possibly use at that stage of development. Many think it's grass just going to waste. Many of the grass clumps scattered throughout the stand must be allowed to mature and seed in order that new seedlings of the better perennial grasses may become established.

There are marked differences in time of range-readiness from the more southerly latitudes to the northern extremes of the southern pine belt. New growth of grasses varies by as much as a month from south Florida to north Florida. These differences are accented where major increases in elevation occur. As one progresses from the near sea level coastal plain to the mountainous terrain of north Arkansas, a considerable lag in range-readiness is observed.

One method of establishing a sound basis for determining range-readiness or "turn on" date is to identify the key perennial species of grasses which make up most of the forage, i.e., the two or three species the rancher will most depend upon to furnish feed for his livestock during the normal grazing season. This is especially important when the operator intends to stock the range to its optimum safe grazing capacity. These key species should exhibit sufficient new growth to "gain" over grazing use for the first six weeks. Because there is so much difference in the appearance of new growth on a freshly burned range as compared to an area with a two or three year old rough. Careful attention needs to be given this item. The general appearances of new growth and amount of new growth can be very deceptive on the rough areas.

2.21 Indicators of Range Readiness. A generally reliable indicator of range-readiness involves an observation of the stage of development of plants other than grasses. In the Ouachita and Ozark mountain areas when birdsfoot violet (Viola pedata) is in full bloom on the slopes, and wild hyacinth (Camassia scilloides) is blooming in the creek bottoms, grass has normally developed sufficiently to make it safe for grazing without harm. Service berry (Amelanchier arboreum) will be in full bloom and black locust (Robinia pseudoacacia) is just about to bloom.

In the coastal plain longleaf pine-bluestem range, the matter of range-readiness is less critical because some native grasses stay green throughout the year. However, pinehill bluestem, which is the dominant forage species, is generally ready to begin grazing when false dandelion (*Krigia dandelion*), sheep sorrel (*Oxalis violacea*), butterweed (*Senecio glabellus*) and the atamasco lily (*Zephyranthes atamasco*), sunbonnets (*Oenothera speciosa*), and yellow stargrass (*Hypoxis hirsuta*) are blooming conspicuously. Fringetree (*Chionanthus virginica*) and yaupon (*Ilex vomitoria*) are in full bloom. Moving over to the wiregrass-pine ranges of south Alabama and Georgia and north Florida we find tarflower (*Befaria racemosa*), wicky (*Kalmia hirsuta*), and titi (*Cyrilla racemiflora*) at bloom peak about the time the wiregrasses begin to become nutritious again.

Determining date of range-readiness is largely a matter of the individual rancher drawing from his past experiences as what to expect from conditions as he finds them in the spring. Since it is not possible to anticipate a wet, dry or normal grazing season at "turn on" time, the wise rancher should provide himself with sufficient safeguards against a possible forage shortage.

It should be recognized that a lightly-stocked range can be safely grazed earlier than can a heavily-stocked range.

2.3 Livestock Distribution. Of prime importance to the livestock operator is that part of herd management concerned with getting his livestock to utilize the forage as uniformly as possible throughout the range. There are several techniques the operator may employ to help him do this; however, he first needs to analyze his particular problem and determine why it is his cattle tend to overgraze or concentrate in one part of the pasture to the exclusion of other areas.

2.31 Factors Affecting Distribution. Among some of the more important reasons leading to poor distribution in the South are steep topography, deep flowing streams, insufficient or poorly planned prescribed burns of insufficient area, heavy rough, and insufficient salting, supplemental feeding, and water locations. In the Coastal Plains, livestock use is closely tied to timber harvest and prescribed burning. After almost any type of cutting operation there is an immediate response in the amount and quality of ground cover. A fresh burn will attract cattle to the new plant growth and they will walk great distances across a two or three year old rough to get to such grazing. They will keep a burn nipped to the ground if such areas are small in size and cattle numbers too high. The continued, intense use of such areas may replace the more desirable bluestems and panicums with a solid cover of carpet grass.

Some areas have sizeable tracts on hillsides where cattle will graze very little until the bottoms and more gentle slopes have been overgrazed. Providing salt at strategic points on such slopes will help to attract the cattle to these areas and some utilization of the forage is obtained.

It has been observed that in most instances, as soon as the cattle have satisfied their salt needs, they will drift down toward the flats and water. A combination of salt and watering facilities is the best solution. But here again the decision to install a permanent water facility on a slope sufficiently steep to discourage cattle from grazing must be carefully weighed. Such a slope is a prime erosion hazard and concentrations of cattle on such places can only add to the hazard. Once erosion has begun, such areas are difficult and expensive to rehabilitate.

Physical barriers, such as deep streams, can often cause poor distribution. While this is most often only a seasonal deterrent to cattle crossing over to the other side of a pasture, there are many streams that are permanently deep and combined with marshy areas for considerable distances back from the stream that add to their effectiveness as a barrier to crossing. Where possible, barriers of such magnitude should be made a boundary of a management unit.

Where streams are only intermittent obstacles to cattle freely crossing from one grazable area to the other, the most effective practice in getting uniform use is to rotate one side with the other, providing all facilities such as water and salt on both sides. Forcible driving of cattle may be necessary from time to time as dictated by the development of the forage or use observed on one side or the other.

2.32 Use of Water to Improve Distribution. Insufficient or poor distribution of permanent water facilities is frequently a major cause of poor livestock distribution. Special attention should be given this item during times of drought when concentrations of cattle around a single water facility serving a large grazing area can do irreparable harm to nearby forage and soil values.

Water for livestock is an absolute necessity. Therefore, it is one of the most effective means of attracting cattle to use forage in areas they habitually stay away from because of lack of water.

As a general rule of thumb, cattle should have water available within a mile of the farthest grazing. The ideal is to have a permanent water facility no farther than one-half mile from farthest grazing.

2.33 Burning for Distribution. The practice of burning by livestock operators has been a universal custom throughout the South since the times of earliest settlement. The practice was adopted from the Indians who habitually burned the woods to provide for easier hunting of game and for the simple expedient of making foot travel in the woods less difficult.

Controlled burning of the pine type in suitable burning areas offers the best opportunity to distribute livestock where you want them. When a prescribed burn is properly done, taking into account season, temperature, and date since last rain, it can be controlled to effectively reduce the rough without damage to the grass plants. Such a burn will provide an immediate plant response with improved palatibility, quality, quantity, and availability of grasses and forbs.

Necessarily, prescribed burning must be tied into timber and other resource considerations and this may sufficiently restrict a burning program for optimum benefits to grazing distribution - when done on small size management units.

There are several reasons why a good prescribed burn area attracts cattle. All new growth is fresh and green and the cattle don't have to fight the dead material which has accumulated from the growth of previous seasons. Protein, phosphorous, and calcium are higher in spring forage from burned areas. It has also been found that total forage production over the years is higher on areas where burns have been carefully controlled as to season and temperature, and that seasonal gains of cattle are as much as a third higher when grazing these areas. The problem of distribution is largely eliminated when such areas can be uniformly scattered over a large pasture or rotated with similarly-sized units on small pastures. On any area, stocking rate of cattle must conform to area size to prevent overgrazing. While close grazing of new growth as found on a fresh burn will keep vegetation palatable and nutritious, and extend the period of profitable grazing, care must be taken to prevent livestock from concentrating to such an extent that the native grasses are eliminated and carpetgrass and annual weeds take over.

2.34 Salting for Distribution. Salt will attract livestock and is a useful tool in achieving better distribution. Place the salt in areas where more use is desired and away from overused areas. This usually means that the salt will be placed well away from water, openings in the timber type,prescribed burns, roadsides, etc.

Do not establish permanent saltgrounds. Move the salt to a new location at least annually to avoid concentration of livestock and trampling out an area. The salt should be kept off the ground and placed in troughs, securely fastened to tree stumps, or put on bare rock areas.

The same principles of using salt to attract livestock and achieve better distribution also applies to supplemental feeding locations.

2.4 Coordination with Other Uses. Frequently a farm or ranch can support many different uses of the basic soil resource and land area represented. Although the modern day tendency is towards specialization in agriculture, there is still room on most farms and ranches for more than one crop. Ideally, these crops should be so selected and organized as to be complementary and dovetailed into a land use and management entity that recognizes the needs of all crops. This management concept does not necessarily produce the maximum of any one crop that might be possible, but is directed towards something less in order to achieve compatibility with other crops and achieve the best return from the land.

The careful organization and coordination of multi-crop production is necessarily a problem of the landowner and will be to a large part dependent upon his personal desires. Livestock grazing, if properly done, can be managed to blend in with most of the major land uses and produce a profitable return, but in all cases this will mean that the maximum production of none of the crops will be realized - only the maximum production that is compatible with the production of other crops.

2.41 Coordination with Timber. Grass yields in southern pine forests are highest when trees are small. As pines grow and their crowns close, forage declines. Rarely is grass completely eliminated. Over the bulk of the range, it persists in varying amounts. Yields of grass are least beneath dense pole sized stands, but increase as trees grow larger and taller and some are cut.

Natural longleaf stands generally are more open and have more forage than slash pine stands. When number, height, and size of the trees are the same, probably about as much grass grows in slash pine stands as in longleaf.

The relation between trees and grass is much the same for planted pines as for natural stands. The main difference is in tree spacing and forage composition. In natural or seeded stands the young trees, particularly slash pine, often form thickets under which grass declines rapidly. In plantations, spacing between trees can be controlled at the beginning to encourage grass growth for several years.

In the past, plantations have been established with a high density of trees per acre - sometimes exceeding 1000 per acre. There is substantial proof that the yellow pines will produce more, faster and cheaper, under much more open planting. Spacing of 12' x 12' (300 trees per acre) or 8' x 12' (450 trees per acre) are being used by many landowners, not only from the standpoint of improved timber production, but also as a means of improving habitat for wildlife and domestic animals.

Furrowing, disking, or other soil disturbance incident to planting or seeding, encourages carpet grass and common Bermuda grass at the expense of native bunch grasses. These invading species are less tolerant of shade and litter and, as the timber stand develops, may be expected to give way to bluestems, panicums, threeawn, and paspalums.

As the pines grow, thinnings are necessary for optimum production of timber and grass. The first thinning usually comes when trees average about 6 inches in diameter - big enough for pulpwood, After that, thinnings may be at regular intervals, perhaps every 5 years.

In the longleaf-slash pine belt, forage and timber management are closely linked to prescribed burning. Pine litter rapidly accumulates beneath well-stocked timber stands and, unless removed by occasional prescribed burns, will drastically reduce grass growth. If done properly, burning improves the palatability, quality, and availability of grasses. From the standpoint of the timber grower, it is useful to control undesirable hardwoods, pine stands, reduce the hazard from wildfire, prepare seedbeds, and control brown spot on young longleaf pines.

Except on some lands in south Florida where timber growing is secondary to cattle grazing, burning for forage improvement should be done only after timber and other forest uses have been fully considered. Where new pines are being started, fire must usually be excluded until the trees are 8 to 10 feet tall, except as burning is necessary to reduce brown spot needle infection of longleaf seedlings in the grass stage. Thereafter, it may be used advantageously at 2 to 5 year intervals. In some sections of south Florida, separate parts of the range are occasionally burned at different seasons to maintain grazing the year round.

Table III on the following page contains a recommended burning schedule for protecting trees under changing forage and timber conditions.

With cattle grazing the range, some damage to young trees is inevitable, especially on regeneration areas. The planted areas have been disturbed, creating forage and accessibility conditions that the cattle find favorable, and they will concentrate on such areas if given free choice. Injury to pine reproduction on properly managed and stocked ranges is not usually serious, and although some trampling, and at certain seasons of the year, browsing may occur, it will be well within acceptable limits.

On some pine ranges, grazing modification may be necessary to prevent cattle from concentrating where pines have been planted or seeded. The most critical period is late fall and winter when green forage is scarce, nutrient levels low and the cattle may browse as well as trample pines. Trees that have been fertilized in the nursery have high nutritive content and are particularly susceptible to browsing. Some methods of modifying the grazing to minimize grazing in plantations are:

1. Water, supplement and salt control. As has been discussed under 2.3 - Livestock Distribution, salt, supplements and water may be used to attract cattle to areas where more use is desired, and conversely, pull them away from areas where less use is desired. Place the salt, supplements and water well away, 1 mile if possible, from plantation areas and close off waters near the plantations. This will not be completely effective, but may reduce damage to an acceptable level.

2. Prescribed burning or fertilization of other areas. Prescribed burns and fertilized areas will attract and hold cattle. When planning the plantation, also plan on developing burned or fertilized areas well away from the plantation to attract and hold the cattle.

3. Rotation grazing. If the range is fenced into management units, the rotation of the grazing on the units should be scheduled to avoid the unit containing the plantation, or to graze it only during the spring, summer or early fall. This will eliminate any need for additional fencing.

4. Removal of cattle. Most cattle browsing and trampling of young pines occurs in the fall and winter when green forage is scarce or unavailable and the nutritive content of the grasses is low. Under light to moderate grazing, serious damage will be completely avoided

TABLE III

Recommended Grazing and Burning Schedules for Protecting Trees Under Changing Forage & Timber Conditions

Timber Stand Condition	Grass yields per acre(green weight)		Burning Schedule	Grazing Schedule		
	Bluestem	Pineland threeawn		Bluestem, yearlong	Pineland threeawn	
					Georgia, spring and summer	South Florida, yearlong
	Pounds	Pounds				
No trees	3,000	2,000	2-3 years	15 ac. per cow	14 ac. per cow	23 ac. per cow
One-year-old seedlings	3,000	2,000	Exclude fire	Exclude cattle or graze lightly-20 ac. per cow	Exclude cattle or graze lightly - 20 ac. per cow	Exclude cattle or graze lightly - 30 ac. per cow
Seedlings & saplings less than 8 ft. tall	2,600	1,600	Exclude fire	Graze lightly-23 ac. per cow	Graze lightly - 30 ac. per cow	Graze lightly - 40 ac. per cow
Saplings taller than 8 ft. but less than 6 in. in diameter	1,400	1,000	3-4 years	Graze slender bluestem heavily, other bluestems moderately - 30 ac.per cow	Graze moderately - 26 ac. per cow	Graze moderately - 45 ac. per cow
Pulpwood, 6-12 inches in diameter	650	700	2-4 years	Graze slender bluestem heavily, other bluestems moderately - 60 ac.per cow	Graze moderately - 39 ac. per cow	Graze moderately - 66 ac. per cow
Sawtimber, 12 inches and larger in diameter				Graze slender bluestem heavily, other bluestems moderately - 30 ac. per cow	Graze moderately - 22 ac. per cow	Graze moderately - 38 ac. per cow

by removing the cattle in the fall and not returning them until spring when ample green forage is available.

5. Fencing. This is the total solution, but expensive and usually unnecessary with controlled numbers and proper management. The landowner will be better off to put the fence money into division fencing of the range area and adopting a rotation system of grazing that avoids use of the plantation area. Stands of slash pine may need to be fenced for only 2 to 3 years, but longleaf pines will need protection until they are well out of the grass stage. A three strand barbed wire fence will turn cattle - electric fences are seldom satisfactory in the woods.

6. Chemically treat seedlings. As a temporary preventive, seedlings can be treated with chemicals. Copper carbonate has been the most effective repellent to date. On a range with extremely heavy cattle concentrations in central Louisiana, about half of the seedlings treated with this chemical escaped with little or no grazing. Untreated seedlings were killed or damaged.

The repellent is applied by spraying or dipping the seedlings immediately before they are planted. It is prepared by mixing 1 gallon of asphalt emulsion, available at many building-supply stores,with 6 gallons of water and adding 5.7 pounds of copper carbonate (0.55 percent metallic copper, of the light, fluffy, commercial grade). The mix will treat about 12,000 seedlings, and the cost is small.

Copper carbonate must be used cautiously, as it is somewhat toxic to young seedlings. Damage usually is not serious when the soil is moist, but during droughts the copper carbonate may increase the number of seedlings that die. It is best to plant seedlings the same day they are treated. They are likely to be damaged if held for more than a day, especially if they are stored in bundles.

2.42 Coordination with Recreation. Open range grazing under controlled and managed conditions is usually completely compatible with open dispersed type recreation use of the same area and is in many cases complimentary. On some areas of public land where intensive recreation use is a major consideration, livestock grazing is being retained to enhance the recreation values and provide a means of control of shrubs and invading plant species.

Most landowners demonstrate little interest in the use of their lands by the public for recreation purposes and it is their decision to make. However, the benefits to be derived from commercial recreation enterprises should not be overlooked in planning for the grazing use of the area. The sale of hunting permits for large or small game and the leasing of private lands for hunting purposes are quite profitable for many landowners - others are developing commercial campgrounds in areas of high recreation potential. For best results, any of these uses must be coordinated with the other resource uses of the area.

Areas of concentrated recreation use, such as a campground, should be fenced to exclude cattle. Most recreationists don't object to livestock in the vicinity of their camp or picnic site. Many enjoy the animals and numberless children have squealed with joy at the experience of seeing a cow, or horse or sheep. But few people care to share their campsite or picnic with a herd of domestic animals and a bull polishing his horns on a tent pole can be alarming. Keep the cattle away from the concentrations of recreationists - the recreation area itself can be grazed during the off season, if need be.

See the section 2.44 Coordination with Wildlife for a more complete discussion of enhancement of the wildlife habitat.

2.43 Coordination with Soil and Water Resources. The soil value is perhaps the most important resource on any given land area. The soil is the basic nonrenewable resource upon which any farmer or rancher depends for a living. Protection and development of this resource must be the basic and overriding consideration of any land use. In the past, under unmanaged conditions and uncontrolled and excessive numbers, much damage has been done to rangelands by domestic animals. Under controlled numbers and properly managed grazing, profitable use of the forage resource can be made without damage to the soil or other resources.

Coordination of grazing with the soil resource is nothing more than good range management. The same range and livestock management activities that pay the greatest returns to the cattleman, such as proper stocking, good distribution, and proper season of use will also pay the greatest returns in the protection and development of the forage and soil resource. Areas of overuse must be avoided and management altered to pull the livestock away from them.

Livestock will tend to favor certain areas and if given free choice will develop "lying" grounds where they prefer to rest and meditate - they will also develop trails used in moving from one area to another. These favored areas will eventually become compacted and beat out and subject to severe erosion if concentrated use is allowed to continue. Using the methods described under Chapter 2.3 Livestock Distribution, alter the management plan to pull livestock from these favored areas.

If erosion areas exist that the landowner wishes to treat and rehabilitate, use the same methods described for protection of tree plantations under 2.41 - Coordination with Timber to reduce or eliminate livestock use from the treated area.

The production of quality water is another consideration to be coordinated with livestock use of forested ranges. Pollution of runoff and streams by animal wastes, dead animals and feeding operations should be avoided. Some coordination practices to be considered are--

--Location of corrals, feedgrounds, saltgrounds and other areas of concentration should be away from streams or drainages so that the contaminated water runoff from them can pass through a filtering process before reaching the flowing stream. Location of these facilities on ridgetops or higher areas will also provide better drainage and promote a drier and more usable improvement.

--Prompt disposal, preferably by burning, of dead animals. Many States have laws requiring this, both from the standpoint of water pollution and to prevent the possible spread of disease.

2.44 Coordination with Wildlife. The forestland range manager may wish to produce wildlife concurrently with livestock and timber for personal enjoyment or for economic gain. Several species of native upland game can be managed in harmony with range programs in the Coastal Plains. These include principally the whitetailed deer, wild turkey, gray and fox squirrels, bobwhite quail, and mourning doves. For optimum results, however, determined efforts in resource coordination are required.

Wildlife resources are convertible to cash income directly through the sale of hunting and fishing rights or indirectly by furnishing goods and services to sportsmen. In areas of well-stocked deer and turkey range, profits from the sale of hunting rights on a daily or seasonal basis may approach or exceed the yield from other resources. The same is true on a lesser basis for small game, as for example, pheasant hunting in South Dakota, or Georgia's renowned quail hunting.

The landowner interested in managing wildlife resources for profit will need to explore applicable state game laws, trespass and liability laws, the need for sportsmen facilities, added costs of maintaining fences and range improvements, and the added risk to livestock and property from possible wildfires, accidental shooting, and other hazards.

Suggestions for coordinating forestland grazing with wildlife habitat management are:

1. Deer. Coordination of cattle and deer management requires control of grazing intensity, deer, and livestock numbers. Overstocking of either deer or cows will reduce carrying capacity for the other. Generally, however, deer and cows do not compete as strenuously for preferred foods as do deer with goats and sheep. As grazing approaches full capacity of the range, competition between deer and cows becomes more direct. Range managers should allocate forage use accordingly. One rule of thumb suggests that one cow unit of use equals five deer units.

   Deer range quality varies directly with the kinds and quantities of browse available at critical times of the year. As with cattle, not all plants provide usable browse for deer; thus cattle compete with deer to the extent that they consume preferred species needed for good health, body weight gain, and reproduction. Because deer have a less efficient digestive system than cattle they generally require foods higher in energy and protein content. For this reason deer are more dependent upon highly nutritious foods such as acorn mast, fruits, new browse growth and buds. Usable browse is limited to preferenced species which deer can digest efficiently.

Measures recommended for coordination of deer and livestock management in forestland grazing programs are:

a. Exclude cattle from hardwood bottomlands and if feasible from all forestlands during winter months.

b. Implement rotational grazing, prevent overgrazing.

c. Make stock watering facilities available to deer.

d. Do prescribed burning for range improvement.

e. Exclude fire and cows from thickets and evergreen cover.

f. Encourage maximum harvest of surplus deer by hunting.

2. Wild Turkey. The need for coordination of forestland range management with wild turkey management increases from Florida westward. While grazing is not considered detrimental to turkeys in Florida, undesirable effects become more apparent to the north and west. Grazing by goats and sheep and direct competition for mast by hogs is regarded as more detrimental to turkey than is cattle grazing. However, heavy woodland grazing which eliminates or seriously reduces the variety and production of understory fruiting shrubs and food plants will reduce turkey populations. Moderate grazing of pine types probably favors turkeys by encouraging the growth of grasses, legumes, crotons, and other foods and by maintaining open stands; heavy grazing prevents seed production, eliminates legumes, and destroys nesting and escape cover.

Recommended measures for coordination are:

a. Exclude cattle from hardwood stands, especially stream bottoms.

b. Prevent heavy grazing and the depletion of food supplies.

c. Practice rotational grazing if feasible, particularly on the more western ranges.

d. Make stock watering facilities available to turkeys.

e. Spare roost trees and nearby areas of escape cover in range improvement programs.

f. Practice prescribed burning in pine types.

Prescribed burning will favor wild turkey if care is taken to exclude fire from hardwood stands, bottomlands, nesting and escape cover. In the longleaf pine type, burning on a three year rotation with cool night fires in December, January, or February is recommended.

Turkey may be attracted to supplementary feed lots during winter months. Such areas provide prime hunting as well as important winter food supplies for turkey. However, care should be taken to avoid overharvest of birds thus attracted and to be sure that any applicable state laws pertaining to baiting are observed.

3. Small Game. There are opportunities for coordinating grazing programs with small game as well as deer and turkey management. Species to consider include bobwhite quail, mourning doves, gray and fox squirrel.

Gray squirrels apparently need not only abundant hardwood mast supplies but also a dense shrub understory that furnishes cover and concealment. Exclusion of cattle from hardwood sites will benefit gray squirrels. Fox squirrels, which generally prefer more open, park-like stands and which utilize a broader range of foods, are favored over grays by moderate cattle grazing. However, grazing which prevents establishment of a hardwood component in new stands and fruit producing shrubs in older stands, will be detrimental even to fox squirrels. Prescribed burning which encourages browse production at the expense of fruit yielding shrubs will also harm fox squirrels.

Grazing in pine types and quail management are compatible, particularly if prescribed burning to stimulate legumes is practiced. Thickets and small areas of heavy rough should be preserved. Annual burning with a fast moving late winter or early spring fire is recommended to stimulate legumes, especially the preferred partridge pea. Usually such a fire will not burn clean, thus sparing thickets on moist sites and preserving needed cover.

Old house sites often contain fruiting shrubs, vines, forbs, grasses and cover important to many species of wildlife. Fencing such areas as well as any food plot plantings may be critical to simultaneous production of wildlife and grazing uses in southern pine woodlands.

2.5 Nutrition and Supplemental Feeding. Virtually all range forage in the South is seriously deficient in nutrients during the fall and winter months and range forage must be supplemented if cattle are to thrive. Without supplements, susceptibility to parasites and disease is high, malnutrition results in heavy death losses, average calving seldom exceeds 50 percent, and weaned calves frequently weigh less than 300 pounds. These conditions are not conducive to a profitable cattle operation.

Table IV on the following page illustrates some results of research into the production of beef from herds receiving good yearlong feed and from herds not adequately fed.

TABLE IV

Production of Beef from Herds Receiving Good Yearlong Feed and from Herds not Adequately Fed

Type of Operation	Seasonal Feed Supply				Calf Crop	Calf Weights	Death Losses	Beef Produced per Cow[1]
	Spring Apr-June	Summer July-Sept.	Fall Oct.-Dec.	Winter Jan.-March	%	lbs.	%	lbs.
Good Yearlong Feed Farm and fenced National Forest range	Fenced forest range	Fenced forest range	Improved pasture	Improved pasture, 100 days' supplement of 2 lbs. cottonseed meal and 4 lbs. hulls per head per day	78	355	2.0	263
Farm and leased fenced forest range	Fenced forest range	Improved farm pasture	Field gleanings and farm pasture	Farm pasture and winter oats grazing, 90 days with supplement of 1 lb. cottonseed meal and 8 lbs. hay per head per day	74	350	3.0	238
Poor yearlong feed Farm and free forest range	Free forest range	Free forest range	Free forest range	Main herd on free forest range with no supplement. Weak cows on farm pasture and 1 lb. cottonseed meal and 2 lbs. hulls per head per day	37	275	5.7	68
Yearlong on free forest range	Free forest range	Free forest range	Free forest range	Free forest range, 60 days' supplement of 1/2 lb. cottonseed meal and 2 lbs. hay per head	35	300	6.4	67

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[1] Beef production includes total weight of calves produced per cow less weight of cows that died. Cows in the well-fed herds averaged 700 pounds, those in the poorly fed herds 600 pounds in fall.

2.51 Forage Quality. Range forage is most nutritious in spring and summer, and cattle weight gains are highest then. During this period mature cows, from herds grazing bluestem range and producing 75 to 80 percent calf crops, gain an average of about 165 pounds each. Pineland threeawn forage is not as nutritious as bluestem forage in summer, and cows grazing the threeawn gain less. In Georgia, dry cows on pineland threeawn range gain about 155 pounds during spring and summer. Wet cows do little more than maintain body weight and may lose 50 pounds or more per head during this time.

Nutritive value of the forage declines in fall and winter. Even when fed protein and mineral supplements, cows that calve during the winter will lose about 200 pounds on bluestem range. Dry cows generally lose less than 75 pounds. Pineland threeawn forage is so low in nutrients during the winter that cattle are ordinarily taken from the range and put in feedlots or on improved pasture.

The range manager can influence forage quality considerably by controlling the closeness of grazing and making prescribed burns. The quality of range forage is judged by protein and mineral content and by digestibility.

Some factors affecting forage quality are:

1. Crude protein, Protein is essential for cattle growth, weight gains, appetite, milk secretion and regular oestrus in cows. New grass shoots are relatively high in crude protein.

On pineland threeawn ranges in Georgia, grass contains approximately 6 percent crude protein in spring, but if the range is burned in winter the spring forage will ordinarily contain 10 to 12 percent. Three to four months after grass growth begins, the crude protein falls below 6 or 7 percent, less than the minimum needed by a cow that is nursing or carrying a calf.

New grass growth on unburned bluestem range normally contains 8 to 9 percent crude protein in spring. On ranges burned in late winter or early spring, the percent will be from 10 to 12. In July and August protein content is about 7 percent or slightly higher if summer rains bring on a new surge of growth. In winter, it may fall to 3 or 4 percent.

Repeated grazing has much the same effect as burning in increasing the succulence and protein content. Cattle continually seek out plants previously grazed. In Louisiana, bluestem forage that was frequently harvested contained 9 to 11 percent crude protein, while that on unharvested plots had 5 to 6 percent.

Protein holds up best through the summer on ranges containing carpetgrass, bluestem, and some of the taller bunchgrasses, such as lopside Indiangrass and switchgrass.

Forbs, especially legumes, are often higher in protein than grasses. Swamp sunflower may contain up to 10 percent in late summer and early fall. Seed heads of sunflower, certain legumes, and other forbs often have more crude protein, and also more minerals, than the leaves.

Spring growth of browse plants such as summersweet clethra, American cyrilla, and blackgum often has 13 percent crude protein. The evergreens, dahoon and greenbriers, are sought in winter when green feed is scarce. Their protein content of 8 to 10 percent exceeds that of leached herbaceous plants. Although browse contributes protein to the cattle diet in winter, it fails to compensate fully for deficits of other forage.

Where browse plants from dense thickets and grow beyond the reach of cattle, burning will open up the clumps and induce new growth. Cattle find the young vigorous sprouts more palatable and nutritious than the twig growth of older stems.

2. Phosphorus. This is the mineral most often deficient in native forage. Marked deficiencies of phosphorus are accompanied by loss of appetite and reduced rate of gain in animals. They may eventually have "stiffs" or similar bone changes, and milk production and reproductivity of cows may be impaired. Phosphorus content usually decreases as plants mature. On unburned ranges, grasses may have less than 0.08 percent phosphorus for most of the year. On ranges burned in winter, phosphorus amounts to around 0.12 to 0.14 percent for about 2 months in spring. This is barely adequate for dry cows and considerably below the 0.18 percent required by pregnant and lactating cows. Most forage species are deficient in this element. Swamp sunflower and legumes are relatively high. In winter, evergreen browse ordinarily contains more than other plants.

3. Calcium. Calcium is one of the most important minerals for bone-building, growth, and reproduction. In Louisiana, most forage has more than the 0.20 percent thought necessary for breeding herds. Swamp sunflower is exceptionally high at all growth stages.

Eastward into Georgia and Florida calcium in forage rarely exceeds 0.18 percent. Most browse is high in calcium, but cattle usually do not eat enough of it to compensate for the deficiency of the other forage.

4. Cobalt and copper. These minor minerals may be deficient in vegetation in parts of the Coastal Plain. A lack of either cobalt or copper may cause loss of condition, stunted growth, diarrhea, and anemia in cattle. Both are likely to be deficient in vegetation in central and southern Florida. In Georgia, commonly grazed herbaceous plants are wanting in cobalt and borderline in copper. The deficits are probably balanced by plentiful cobalt in browse plants, such as blackgum and summersweet clethra, and by liberal amounts of copper in sawpalmetto and other shrubs. Cobalt and copper are adequate in bluestem forage of Louisiana during spring and summer, and cattle show no symptoms of deficiencies in winter.

5. Digestibility. Information about the digestibility of native forage is scanty. On pineland threeawn range in south Georgia, digestible crude protein of the grasses is almost adequate for lactating cattle in spring and summer but is extremely low in winter. Total digestible nutrients are enough for lactating cows from spring through fall.

In winter, cattle should be taken off the range because forage then is so low in total digestible nutrients that protein and mineral supplements cannot economically make up the deficiency. The 25 to 30 percent lignin in some browse plants during winter undoubtedly contributes to low forage digestibility. In Florida weight losses of cows wintering on native range indicate that forage digestibility may be about the same as in Georgia. On bluestem range in central Louisiana, cattle wintered well when forage was adequately supplemented with cottonseed cake, plus loose salt and steamed bonemeal fed free-choice.

2.52 Use of Supplemental Concentrates. Range cattle must be supplemented with concentrates, or hay, during periods of low range forage plant nutrients. Concentrates are feeds that are low in fiber and high in total digestible nutrients. Some commercially or home-grown items available to the livestock operator are the various grains, wheat bran, cottonseed meal or cake, linseed meal, bonemeal, etc. All so-called concentrates are not necessarily high in protein or in the necessary minerals needed for livestock, and many concentrate mixtures contain minerals that are not needed.

The livestock operator should have his own particular situation appraised, determine the specific nutrient deficiencies that are common to his area and purchase concentrates and minerals to fill this need.

Some commonly fed concentrates and minerals and their application are:

1. Protein concentrates. Cottonseed meal or pellets (41 percent crude protein) is the most widely fed and practical protein concentrate. Normally, feeding starts in October or November, but it should begin earlier if crude protein of forage drops below 7 percent, or if cows show signs of losing weight rapidly. During the fall 1 to 2 pounds per animal per day will be sufficient. When cows remain on range, the rate should be stepped up to 3 pounds per day for the 2 or 3 winter months when forage quality is lowest. Feeding may stop after forage greens up in spring. About 375 pounds per animal each year is enough on most ranges. The best place for meal is in troughs, but pellets may be scattered on the ground without excessive loss. Troughs should be moved occasionally to prevent the vegetation from being trampled out.

Feeding protein concentrates during spring and early summer has not proved practical.

2. Phosphorus and calcium. These minerals should be accessible in feedboxes all year. Steamed bonemeal (32 percent calcium, 15 percent phosphorus) is most widely used and with apparent good results. To induce consumption and prevent spoilage, two parts of meal are often mixed with one part of salt. Yearly consumption of this mineral mix varies from 18 to 75 pounds per head according to weather, quality of forage, and mineral content of other feeds. If a greater intake is desired, molasses or cottonseed meal can be added to increase palatability.

3. Minor mineral elements. Minor elements are often added to mineral mixtures as a precaution, but the only area of demonstrated need is south Florida. Mixtures suitable to this area contain red oxide of iron (3.12 percent), copper sulfate (0.63 percent), and cobalt chloride or cobalt sulfate (0.04 percent).

Table V on the following page outlines the daily nutritive requirements of beef cattle under varying situations.

2.53 Improved Pastures. For best returns from the livestock operation, improved pastures should be developed and used in conjunction with forest range - the two together make a dependable source of yearlong forage. This combination is especially suitable for cattle owners who have neither sufficient range nor improved pasture to support herds of practical size - 25 head or more. Because forage from improved pastures is higher in crude protein and minerals than most native forage, such pastures improve the condition of cattle and thus better the calf drop.

There are several species of grasses that can be planted in improved pastures - each locality has developed favored combinations that work well. For specific advice, consult the local County Agricultural Extension Agent. Overseeding of the planted grasses with a mixture of legumes such as lespedeza and white clover increases yields, extends the grazing period and contributes to soil nitrogen fixation.

Fertilizer must be liberally applied to improved pastures. Recommendations on fertilizer rates for specific soils, sites, rainfall and temperatures are best obtained from local sources such as the County Agricultural Extension Agent.

Whenever possible, ranges should be separated from improved pastures by fences to avoid concentration on the pastures. To assure regeneration of pasture legumes, grazing pressure must be light while these plants are flowering and seeding.

During the spring and early summer, native forage should be grazed while it is at its optimum palatability and nutritive value, and some of the improved pasturage cut for hay. One or two crops can be harvested each year. The hay from 1 acre - 1.0 to 1.5 tons - is ample to feed a cow in drylot for 3 to 4 months.

TABLE V

Weight of Cattle (lbs.)	Dry Matter (lbs.)	Digestible Protein (lbs.)	Total Digestible Nutrients (lbs.)	Calcium (lbs.)	Phosphorous (lbs.)	Carotene (Mgs.)	Digestible Energy (Thermus)
Wintering Pregnant Beef Cows							
900	13.1-18.4	.65- .70	6.9- 9.7	.044	.037	55	20
1,000	14.2-20.0	.70- .80	7.5-10.5	.044	.037	55	18
1,100	15.2-21.5	.75- .85	8.0-11.3	.044	.037	55	18
1,200	16.3-22.8	.80- .90	8.6-12.0	.044	.037	55	18
Beef Cows Nursing Calves--First 3 to 4 Months							
900 to 1,100	22.0-27.0	1.2 -1.4	12 -15	.066	0.53	90	34
Growing Beef Cattle--Fed for Rapid Growth							
300	7.2- 9.0	.67- .77	5.1- 6.2	.040	.029	20	13
400	9.1-11.4	.76- .87	6.2- 7.2	.044	.033	25	14
500	10.7-13.0	.81- .92	7.2- 8.4	.042	.033	30	16
600	12.4-14.7	.84- .95	8.1- 9.3	.040	.033	35	17
700	14.2-16.5	.87- .98	8.9-10.2	.037	.033	40	18
800	15.9-18.3	.90-1.00	9.5-10.9	.035	.033	45	19
900	17.3-19.7	.93-1.03	10.1-11.5	.035	.033	50	20
1,000	18.6-21.0	.95-1.05	10.6-12.0	.033	.033	55	21
Wintering Beef Calves to Gain 3/4 to 1 Pound Per Head Per Day							
300	7.0- 8.3	.52- .58	3.9- 4.6	.035	.026	17	10
400	8.7-10.3	.63- .70	4.8- 5.7	.035	.026	25	12
500	10.3-12.1	.71- .78	5.7- 6.7	.035	.026	30	14
600	11.7-13.9	.79- .88	6.5- 7.7	.035	.026	35	16
Wintering Yearling Beef Cattle to Gain 1/2 to 3/4 Pound Per Head Per Day							
600	11.6-13.3	.67- .75	6.3- 7.2	.035	.026	35	16
700	12.9-14.8	.76- .83	7.0- 8.0	.035	.026	40	18
800	14.2-16.3	.83- .90	7.7- 8.8	.035	.026	45	18

One-half to one acre of moderately fertilized pasture in combination with 10 to 20 acres of forest range will usually produce enough forage and hay to care for a cow all year. The ratio of pasture to range varies widely by areas and operations.

The following schedule for grazing and feeding cattle and harvesting hay is applicable to many areas:

March - April	Graze improved pasture or pasture-range combination
May - July	Graze range- harvest pasture for hay
August - October	Alternately graze forest range and pasture
November - February	Feed hay in drylot; graze forest range and pasture lightly as available

In many areas grazed firebreaks can be established to aid in fire control for the protection of the forested area and also to serve as improved pastures for the grazing operation. They not only produce good forage for much of the year, but also improve the distribution of the cattle over the range.

CHAPTER 3

CATTLE MANAGEMENT

3.0 Discussion. One of the simplest, but most overlooked, ways of making more money on a livestock operation is in the field of cattle management. The traditional uncontrolled and unmanaged herd of cattle ranging the woods produced little income, but was justified by many because of the low expense involved. With some added effort on the part of the operator to control his animals, regulate their breeding, improve their quality and breed at the proper time, a marginal operation may be turned into a profitable one. This will entail some additional expense and time, but produce a substantial return on the investment.

One of the basic objectives of the livestock operator is to produce beef and derive a profit. It will cost the rancher about the same to support a cow for a year, regardless of whether she produces a calf or not. Carrying dead weight in the form of non-producing cows is frequently the difference between profit and loss. Table VI following is an illustration of the increased annual income per cow for each 5 percent increase in calf crop:

TABLE VI*

Average Weaning Weight (lbs.)	Average Selling Price of Calf Per Pound, Live Weight							
	18¢	20¢	22¢	24¢	26¢	28¢	30¢	32¢
550	$4.95	$5.50	$6.05	$6.60	$7.15	$7.70	$8.25	$8.80
500	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00
450	4.05	4.50	4.95	5.40	5.85	6.30	6.75	7.20
400	3.60	4.00	4.40	4.80	5.20	5.60	6.00	6.40
350	3.15	3.50	3.85	4.20	4.55	4.90	5.25	5.60
300	2.70	3.00	3.30	3.60	3.90	4.20	4.50	4.80

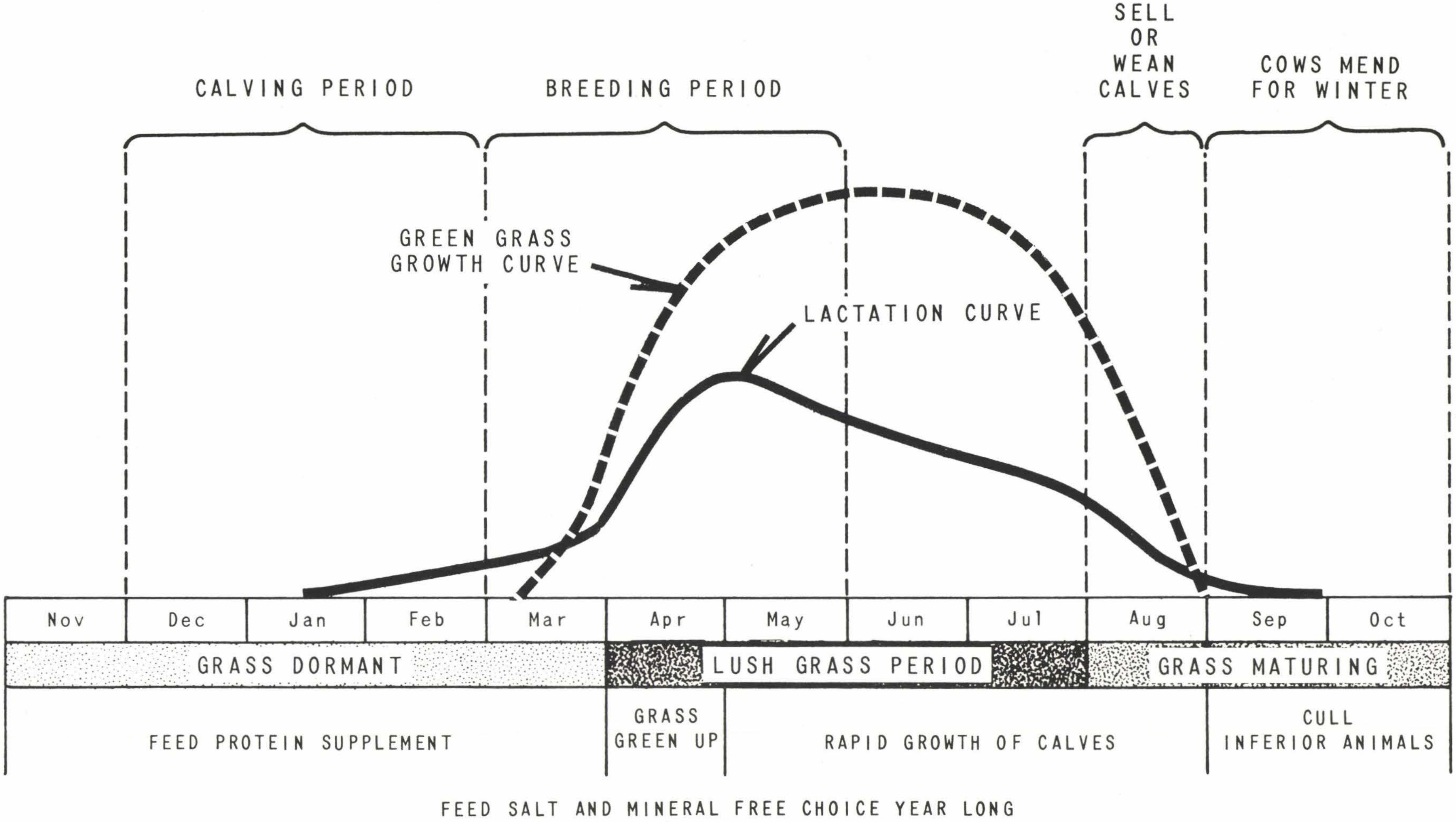
*This table was developed by multiplying the number of extra calves (5) by the average weaning weight by the selling price per pound, and dividing by 100.

The diagram (Exhibit 8) on the following page graphically illustrates a summation of desirable objectives in cow herd management. Observe closely the relationship that should exist between grass production and nutrient values, the calving period, the lactation and the growth and sale of the calves.

The preceding Chapters have stressed methods of handling the forage resource and the use of the forage by cattle - now let us look at the animals themselves and see what might be done with them.

HOW TO TIE LIVESTOCK MANAGEMENT INTO A GRAZABLE WOODLAND OR RANGE CONSERVATION PROGRAM

For Greatest Net Returns Per Animal Unit



CALVING PERIOD
BREEDING PERIOD
SELL OR WEAN CALVES
COWS MEND FOR WINTER
GREEN GRASS GROWTH CURVE
LACTATION CURVE
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
GRASS DORMANT
LUSH GRASS PERIOD
GRASS MATURING
FEED PROTEIN SUPPLEMENT
GRASS GREEN UP
RAPID GROWTH OF CALVES
CULL INFERIOR ANIMALS
FEED SALT AND MINERAL FREE CHOICE YEAR LONG

EXHIBIT 8

3.1 Breeds of Cattle. Livestock men, when they talk about "kind" of livestock, refer to the species of the animal, i.e., cattle, sheep, horses, or goats. "Class" of livestock refers to particular age groups (calves, yearlings, cows, colts, etc.), and "breed" indicated the special group within the species having such characteristics or attributes that will distinctly set them apart from others within the species, (Hereford, Angus, Shorthorn, Brahma, etc.).

Throughout much of the South, the use made of the forest range has been with crossbred cattle exhibiting strains of the original introduction of English, French, and Spanish breeds. Over the years, this mixture of breeds has involved a native type of cow remarkably well suited to the climate and sometimes adverse grazing conditions found in the southern piney woods. With very little or no attention given to supplemental feeding during the stress months of fall and winter, this unique crossbred cow shows unusual ability to survive under the most rigorous conditions. In recent years, however, there has been a slow but noticeable effort to improve the breed. Generally, very few purebred cattle are run on forestland range. These few are largely confined to the areas bordering the Coastal Plains where large areas of cut-over timberland has been converted to improved pasture.

Introduction of hybrid vigor into the herd is one of the most effective ways to increase efficiency of production in beef breeding herds. The objective of hybrid vigor is to increase the performance of the offspring resulting from crossing animals with different genetic backgrounds and performance characteristics. Care must be taken to use the best cross possible to provide the greatest percentage increase in calf numbers and weaned weight.

One of the most common and proven methods of improving herd quality and performance is the introduction of Brahman bloodlines into the breeding program. Brahman cattle have characteristics of size, resistance to heat and insects and disease, and an ability to utilize rough forage, that is not found in most of the British breeds. On the other hand, the British breeds have a beefiness, conformation, and docility that is not common to the Brahmans. A combination of the two animals produces an individual well suited to forest grazing with productive capacity that exceeds either breed alone. This distinction is marked under forestland range conditions, but tends to diminish with an increase in the amount of improved pasture that is made available.

One of the most successful crosses is the breeding of grade Hereford cows, or native cows, to Brahma bulls to produce half Brahma mother cows for the breeding herd. These half Brahma cows are then bred to purebred or good quality English bulls (Shorthorn, Angus, or Hereford) producing calves that are 1/2 Shorthorn (or other British breed), 1/4 Brahman and 1/4 grade Hereford or native. Using this system of breeding in south Georgia, range research scientists observed the following results:

	Bred to Shorthorn Bulls	
	Cows 1/2 Brahman 1/2 Hereford	Cows Grade Hereford
Weaned Calf Percent:		
Range only, no supplement	83	60
Average under varying supplementation and improved pasture	79	71
Weaned Calf Weights	462 pounds	396 pounds
Average Daily Gain	1.67 pounds	1.38 pounds
6 year cow death loss	0	7

Cows with Brahman blood sometimes are considered harder to handle than cattle of predominantly British breeds. However, those who work with Brahman cattle learn their herding and driving habits and can handle them very well. Brahmans are no more difficult to keep under fence than other cattle, but corrals, chutes, and equipment for working them should be 1 or 2 feet higher than for most other breeds.

3.2 Breeding Cattle. Here is a fertile field for improvement in cattle management techniques. There are many factors to be considered in controlling the breeding of the animals - all are important to the successful cattle operation and will be discussed in turn.

3.21 Bulls. Some operators tend to skimp and save money, but it is false economy to take a chance on some of the cows not getting bred. Generally, the operator should procure the best bulls he can afford. Whatever breed is chosen, fast growing bulls that were raised largely on roughage are desirable. Performance rated purebreds are best, and testing the bulls for fertility before putting them with the herd is wise. Good bulls should be retained until their breeding efficiency declines or until inbreeding with their progeny becomes a problem. Normally they should be rotated or replaced every 3 to 4 years. A separate pasture for the bulls must be provided for their use outside of the breeding season.

Usually, in relatively gentle topography and easily accessible areas, one bull for each 20 head of cows to be serviced is sufficient. In rough topography, or areas of difficult travel, the number of cows per bull may have to be reduced; or, if the breeding season occurs while the herd is concentrated on improved pasture, more cows per bull may be permissible.

Remember, don't skimp on the bulls - without a sufficient number, the calf crop and salable product will be reduced with a consequent reduction in profits, and the entire purpose of the operation - beef production - will be defeated.

3.22 Cows. On forested range in many areas of the South, cows with 1/2 Brahman blood will outproduce and provide better results than will cows of one predominant breed. Continual efforts are needed to better the herd. Cows on a fairly high maintenance level should calve 3 out of 4 years under range conditions, with calves weighing more than 400 pounds at 6 to 8 months of age. Cows failing to meet these standards should be replaced.

In selecting replacements, the best choice is heifers from high producing dams or from herds of known production. The heifers should be larger than average, and if selected from the operator's herd should be chosen from mothers of proven ability. Heifers should be 2 years old when first bred. If bred as yearlings, they are more apt to die at calving, or if they survive, are not very likely to have a calf the following year.

Cows should be kept as long as they consistently wean heavy calves. Well nourished range cows do not seriously decline in productivity until they are at least 10 to 12 years old. A common practice among many livestock operators is to keep a number of replacement heifers equal to 10 percent of their breeding herd. This number is usually sufficient to replace aged cows and death losses.

3.23 Breeding Season. The breeding season for cattle on forest range is best limited to about 3 months so that all calves can be weaned and marketed at one time. When calves are dropped throughout the year, extra time and money are required to raise them, and the feeding and grazing schedule of cows is more complicated. Long breeding seasons are unnecessary if a cow does not breed within 3 months, chances are good that she would not breed that year with a longer season. Even if she did conceive, the calf would need special handling and would wean at a low weight.

The generally mild temperatures in the South permit calving during the winter, and calving should be timed so the calves are old enough to eat the new grass in the spring and take advantage of the higher milk production of the mother produced by the new grass and better feed of the spring. With a gestation period of approximately 283 days, it is feasible to place the bulls with the herd from late February through June and most calves are then dropped in December through March. Weaning in early August enable cows to retain or put on flesh before winter. Using this system in Louisiana, calf weight gains averaging 2 pounds per day were realized.

3.3 Costs and Returns. As in any other business venture with relatively small working margins, the forest grazing enterprise has to be well managed. Size and kind of herd, amount and type of range, and quality of facilities are important, but the difference between profit and loss will depend mostly on the skill of the operator.

Possibilities of well-managed operations on bluestem range were demonstrated by a herd that was grazed for 5 years on the Palustris Experimental Range near Alexandria, Louisiana. The 25-cow herd had year-long access to a section of range. No improved pasture was available, but each cow received about 375 pounds of cottonseed cake during fall and winter.

Investment per cow was $285. Fencing and cost of cows comprised nearly 75 percent of this amount. Other costs included watering facilities, corrals, bulls, feed troughs, storage sheds, veterinary supplies, and miscellaneous items.

Operational costs were $48.85 per cow annually of which $18.60 was spent for feed and $13 for labor. Range burning, forage surveys, care of bull, replacement of cows, protection of tree seedlings, taxes, and upkeep of corrals, fences, and troughs were major items of other expense.

Weaned calves averaged 424 pounds. Sale prices ranged from 15 to 28 cents per pound. At an average of 22 cents, the market value per calf was $98.28. The average calf crop was 83 percent, with the gross annual return per cow $77.42. Subtracting from this $48.85, the cost of operation, left a net return of $28.57 or 10 percent annual return on the investment per cow.

In summary:

Investment per cow (Includes purchase, bulls, fences water facilities, sheds, etc.)	$285.00
Cost per cow	48.85
Labor	($13.00)
Feed	($18.60)
Other - herd replacement, taxes, maintenance, etc.	($17.25)
Returns per cow, net Average: Calf weight 424 lbs. Sale price 22¢ /lb. Calf crop 83% Gross/cow $77.42	$ 28.57
Annual return per cow on investment	$ 28.57
Annual return on labor	$ 13.00
Annual return per cow on investment and labor	$ 41.57

Using the grazing capacity figures from Table II (30# of forage per day, 40% utilization) the following returns per acre might be anticipated:

Pounds of Forage/Acre	Acres per Cow Year	Return per Cow on Labor & Investment	Annual Return Per Acre
100	271.0	$ 41.57	$ 0.15
500	54.0	41.57	0.77
1000	27.6	41.57	1.51
1400	19.2	41.57	2.16
1800	14.4	41.57	2.88

The threeawn ranges of south Georgia and north Florida are less profitable. For experimental herds at Alapaha, Georgia, annual feed costs per cow were about $7 more than they were for cows on bluestem ranges in Louisiana, because the cows were in a feedlot during winter. The greater cost of feed, coupled with a lower calf crop (around 77 percent), reduced the net return per cow to $16, or about 5 1/2 percent on the investment. Here, as in the Louisiana operation, land costs were charged off to timber production.

In south Florida vast acreages are used for grazing only, and therefore all land investment costs are chargeable to cattle. Where range and improved pasture are grazed in combination (1 1/4 acres of improved pasture plus 5 acres of range per cow), land investment averages at least $125 for rangeland and $75 for improved pastures, making a total of $200 per cow. The total investment per cow, including fences, watering facilities, and cost of the animal, is approximately $423. Operating costs are about $63 per head. With expected gross returns on $75 (based on 80 percent calf crop, weaned weight of 425 pounds, selling price of $.22 per pound), there would be a net return of $12, or approximately 3 percent of the total investment.

The foregoing estimates do not take into account the indirect benefits of forest grazing. Cattle are valuable collateral in negotiating loans. They offer a way of using off-season and spare-time labor efficiently. Grazing aids in keeping down the grass rough and reducing fire hazard. The fences and continued observation of the herd aid in controlling trespass. Some forest landowners consider these incidental advantages to be as important as the direct income from beef.

Table VII following illustrates the pounds of calf produced per cow needed to pay annual cow cost:

TABLE VII

Pounds of Calf Produced Per Cow Required to Pay Annual Cow-Cost

Annual Cost Per Cow	Average Selling Price of Calf per Pound Live Weight							
	18¢	20¢	22¢	24¢	26¢	28¢	30¢	32¢
$100	555	500	454	417	385	357	333	313
90	500	450	409	375	346	322	300	281
80	444	400	364	333	308	292	266	250
70	388	350	318	292	269	250	233	219
60	333	300	273	250	231	214	200	188
50	277	250	227	205	192	179	166	156

3.4 Leasing of Grazing Privileges. Grazing privileges on private lands are sometimes leased, and a question may arise as to the proper fee. One reasonable solution on bluestem ranges in Louisiana is to accord the cattleman an annual return of 6 percent on his investment and to divide returns in excess of 6 percent between him and the landowner. For example, the yearly grazing fee per cow might be computed as follows:

Net return before grazing fee	$28.57
Six percent on investment of $285	17.10
Net return above 6 percent	$11.47
Grazing fee per cow - 1/2 of net return above 6 percent	$5.70 per year

For south Georgia and north Florida pineland threeawn ranges, this fee would be too high because the return on the cattle investment is lower than in Louisiana. Here a more realistic annual lease rate would be about $2.25 per cow.

Sometimes the landowner furnishes the fence, water facilities, corrals, pastures, etc., and at other times they are furnished by the cattleman. In either case, the party supplying these items should receive the agreed upon percent on his investment in them.

Comparison of several leases now in successful operation on private forest ranges indicates that the most complete leases cover the following points:

1. The exact tract of land to be grazed, the term or duration of the lease, and whether the leased grazing rights are to be exclusive with the lessee or jointly with other stockmen on the same area.

2. Who is to build fences, waters or other developments that may be needed, who is to maintain the existing or constructed improvements and to what standard, who will own the improvements constructed under the terms of the lease and how the cost of these improvements will be amortized.

3. What kind of livestock will be permitted - cattle, sheep, horses with the class specified - calves, cows with calves, yearlings, two-year olds, etc.

4. The number of livestock to be permitted. The lease should provide for periodic range examinations (including arbitration if needed) to see if animal numbers must be reduced, season of grazing changed, or stock handling and distribution altered to protect the range or other resources.

5. The season of grazing - yearlong or spring, summer or fall. If less than yearlong, specify the exact months.

6. The grazing fee. How much is the lessee going to pay for his use of the range. This fee should always be based upon an equitable charge for each month for each animal to be grazed--the animal month. A

minimum total for the specified number and season may be established.

7. The exact use being leased. This should be limited to only the grazing rights with all other land and timber use reserved to the landowner.

8. Responsibility for death or injury of the livestock - the landowner should be free of any obligation in this respect.

9. The responsibility of the cattle owner for handling the livestock so as to avoid damage to land and timber, helping to exclude stray stock and guarding against timber theft and fire.

10. Provision for cancellation of the lease for breach of contract with protection for the landowner in case of cancellation. Forfeiture of prepaid grazing fees or bonding, cash or surety, of the lessee are two ways of protecting the landowner in case of default.

The landowner will probably find it useful to seek the assistance of an attorney in preparing the lease, although a valid contract may be prepared by the lessee. The agreement should always be written, signed by both parties, witnessed and a copy provided to each party to the agreement.

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